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Technical Study 28
**THE MEDIUM-TERM EMPLOYMENT
OUTLOOK:
THE CANADIAN EQUIPMENT AND
MACHINERY INDUSTRY**
Peat, Marwick and Partners
July 1981

**LABOUR MARKET DEVELOPMENT TASK FORCE
TECHNICAL STUDIES SERIES**



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OUTLOOK:
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MACHINERY INDUSTRY**
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This is one in a series of technical studies prepared for the Task Force on Labour Market Development. The opinions expressed are those of the author and do not necessarily reflect those of the Task Force. They do not reflect the views of the Government of Canada.

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ABSTRACT

THE MEDIUM-TERM EMPLOYMENT OUTLOOK: THE CANADIAN EQUIPMENT AND MACHINERY INDUSTRY

Peat, Marwick and Partners

The purpose of this paper was to review the outlook for the Canadian machinery and equipment industry over the next decade and, based upon that review, to forecast the industry's demand for skilled labour.

Our initial work indicated that there were two major problems in deriving such a forecast. The first is the complexity of industry. As defined by the Department of Industry, Trade and Commerce the industry is comprised of 13 major sectors which are, in effect, 13 separate industries which vary considerably in their outlook and requirements for skilled labour. The second problem is the lack of basic data required to derive a comprehensive forecast. Among the missing elements are:

- generally accepted skill definitions;
- a description of the existing skill base of the industry; and
- information regarding the relationship between volume increases and labour demand.

As a result of these two problems our report must be regarded as an overview and a methodological approach to the problem rather than a definitive forecast.

Our work indicated that the Canadian machinery and equipment industry, as a whole, can be expected to experience a real annual growth rate of 4 per cent over the next decade. The limited data available indicated that this growth rate

plus existing vacancies and retiring workers will result in the industry requiring over the next decade 5000 machinists, 2200 fitter-millwrights, 40 welders, 80 maintenance mechanics, 520 tool and die makers, 1800 welder-fitters, 320 electricians, 200 electronic technicians, 120 pattern makers and 180 other skilled workers.

A shortage of skilled workers is widely perceived to be a problem in the industry. The degree to which it is considered a serious problem, however, varies from segment to segment and even between firms within the same segment.

In general terms the industry splits into two major groupings. The first group uses large numbers of highly skilled journeymen; they believe that these highly trained individuals will continue to be needed in the future, and that the supply of skilled labour is a critical, if not the most critical, problem facing the industry. This group also believes that training should be controlled by industry and given "on the job" as opposed to being supplied by educational institutions.

The second major group in the industry uses few highly skilled individuals but rather relies on the semi-skilled worker who is trained to their specific requirements. They see the future in terms of utilizing more of these semi-skilled workers, and while they believe the supply of skilled labour to be a problem they believe it to be manageable. They tend to believe that training should be concentrated in educational institutions which will supply basic technical training, leaving individual firms to train the worker to their own specifications.

SOMMAIRE

PERSPECTIVES D'EMPLOI À MOYEN TERME: L'INDUSTRIE CANADIENNE DE LA FABRICATION DE MACHINES ET D'ÉQUIPEMENT

Peat, Marwick et collaborateurs

Cette étude a pour but d'examiner les perspectives de l'industrie canadienne de la fabrication de machines et d'équipement pour les années 1980 et d'établir, d'après cet examen, des prévisions de la demande de main-d'oeuvre spécialisée pour cette industrie.

Dès les travaux initiaux, on s'est rendu compte que deux problèmes majeurs entravaient l'établissement de telles prévisions. Premièrement, il s'agit d'une industrie complexe: selon la définition du ministère de l'Industrie et du Commerce, cette industrie comprend treize grands secteurs qui constituent en fait treize industries distinctes dont les perspectives et les besoins en main-d'oeuvre spécialisée diffèrent considérablement.

Deuxièmement, il y a des lacunes au niveau des données de base requises pour établir une prévision globale. On note l'absence, entre autres:

- . de définitions communes des compétences;
- . d'une description de la réserve actuelle de compétences de base dans l'industrie;
- . de données sur le rapport entre les augmentations de la production et la demande de main-d'oeuvre.

Il résulte de ces deux problèmes que notre rapport doit être considéré comme un aperçu de la situation et une tentative d'approche du problème, et non comme une prévision définitive.

D'après nos travaux, on peut s'attendre que l'industrie canadienne de la fabrication de machines et d'équipement connaisse dans l'ensemble un taux annuel de croissance de 4% pendant la prochaine décennie. Selon les rares données

disponibles et compte tenu de ce taux de croissance, des postes vacants actuels et du nombre de travailleurs qui prennent leur retraite, l'industrie aura besoin, au cours de la prochaine décennie, de 5 000 régleurs-conducteurs de machines-outils, 2 200 ajusteurs-monteurs et mécaniciens-monteurs, 40 soudeurs, 80 mécaniciens d'entretien, 520 outilleurs-ajusteurs, 1 800 soudeurs-monteurs, 320 électriciens, 200 techniciens en électronique, 120 modeleurs sur métal et 180 autres travailleurs spécialisés.

La pénurie de main-d'oeuvre spécialisée est perçue comme un problème touchant l'ensemble de l'industrie. Le degré de gravité du problème est cependant différent d'un secteur à l'autre, et même d'une entreprise à l'autre.

En règle générale, l'industrie est constituée de deux grands groupes. Le premier fait appel à un grand nombre de compagnons hautement spécialisés. Les entreprises de ce groupe estiment qu'elles continueront d'avoir besoin de ces travailleurs hautement spécialisés dans l'avenir et que l'offre de main-d'oeuvre hautement spécialisée est un problème critique, sinon le problème le plus grave auquel l'industrie fait face. Elles estiment également que la formation devrait être prise en main par l'industrie et qu'elle devrait être dispensée dans le "cadre du travail" et non dans des établissements d'enseignement.

La deuxième grand groupe fait appel à moins de travailleurs hautement spécialisés et dépend davantage de travailleurs moyennement spécialisés et formés en fonction des besoins particuliers de chaque entreprise. Ces entreprises pensent utiliser encore plus de travailleurs moyennement spécialisés dans l'avenir, et même si elles considèrent que l'offre de main-d'oeuvre spécialisée est un problème, elles pensent qu'il peut être surmonté. Elles ont généralement tendance à croire que

que la formation technique de base devrait être dispensée en établissement, chaque entreprise formant ensuite les travailleurs en fonction de ses propres besoins.



EXECUTIVE SUMMARY

Peat, Marwick and Partners was requested by the Labour Market Development Task Force to review the outlook for the Canadian Machinery and Equipment Industry over the next decade and based upon that review forecast the industry's demand for skilled labour.

Our initial work indicated that there were two major problems in deriving such a forecast. The first is the complexity of industry. As defined by the Department of Industry Trade and Commerce the industry is comprised of thirteen major sectors which are, in effect, thirteen separate industries which vary considerably in their outlook and requirements for skilled labour.

The second problem is the lack of the basic data required to derive a comprehensive forecast. Among the missing elements are:

- o generally accepted skill definitions;
- o a description of the existing skill base of the industry; and
- o information regarding the relationship between volume increases and labour demand.

As a result of the above two problems our report must be regarded as an overview and a methodological approach to the problem rather than a definitive forecast.

Our work indicated that the Canadian Machinery and Equipment Industry, as a whole, can be expected to experience a real annual growth rate of 4 per cent over the next decade. The limited data available indicated that this growth rate plus existing vacancies and retiring workers will result in the industry requiring over the next decade 5,000 machinists, 2,200 fitter-millwrights, 40 welders, 80 maintenance mechanics, 520 tool and die makers, 1,800 welder-fitters, 320 electricians, 200 electronic technicians, 120 pattern makers, and 180 other skilled workers.



A shortage of skilled workers is widely perceived to be a problem in the industry. The degree to which it is considered to be a serious problem, however, varies from segment to segment and even between firms within the same segment.

In general terms the industry splits into two major groupings. The first group uses large numbers of highly skilled journeymen; they believe that these highly trained individuals will continue to be needed in the future, and that the supply of skilled labour is a critical, if not the most critical problem facing the industry. This group also believes that training should be controlled by industry and given "on the job" as opposed to being supplied by educational institutions.

The second major group in the industry uses few highly skilled individuals but rather relies on the semi-skilled worker who is trained to their specific requirements. They see the future in terms of utilizing more of these semi-skilled workers and while they believe the supply of skilled labour to be a problem they believe it to be manageable. They tend to believe that training should be concentrated in educational institutions which will supply basic technical training leaving individual firms to train the worker to their own specifications.

I - INTRODUCTION

PURPOSE

The Labour Market Development Task Force requested Peat, Marwick and Partners to review the outlook to 1990 for the Canadian Machinery and Equipment Industry, and, based upon that review forecast the industry's demand for skilled labour. This report is one of several the Task Force has commissioned on major Canadian industries and has, in accordance with our terms of reference, focused on the following major issues:

- o A review of labour constrained output. That is, is the industry likely to be constrained by skilled labour supply problems during the 1980's?
- o A review of which segments of the industry face shortages of which particular types of skilled labour;
- o The perceptions of the industry regarding the supply situation for the various skill categories; and,
- o A discussion of industry perceptions as to possible methods of alleviating perceived shortages.

In addressing the issues of labour demand and supply and reporting on them the major purpose of the study was to focus on the demand for labour. Industry perceptions regarding labour supply issues have been obtained and reported on, but it was not the prime purpose of the report to derive a comprehensive estimate of the supply of labour. The chief objective was rather, to document the likely demand for the various types of skilled labour by the Canadian Machinery and Equipment Industry during the 1980's.

In pursuing our work on this assignment it became clear that the approach of forecasting labour demand on a sectoral basis was very much in its infancy. As a result, in consultation with the Task Force it was decided that while



developing a forecast, our work would also focus on the data and methodological problems inherent in such a project. Our report must, therefore, be considered to be very much a preliminary attempt at developing labour demand forecasts for an individual sector.

SCOPE

As discussed in Section II of this report the Canadian Machinery and Equipment Industry is a very large and complex industry. It is comprised of hundreds of different firms in all parts of Canada producing an extensive array of often unrelated products. These firms are of all sizes and sell into most regions of the world. A fully comprehensive study of this industry would be an extremely large undertaking. Because of time and resource limitations we have observed the following limitations on the scope of our fact finding and analytical efforts for this report:

- o Interviews were undertaken only in Canada and none were conducted with any foreign competitors or customers of the Canadian industry;
- o Interviews in Canada were limited to 20-25 manufacturers located in Ontario and Quebec. No interviews were conducted with customers or suppliers to the industry or with manufacturers located outside the two noted provinces;
- o Our forecast of demand for Canadian products is based upon our analysis of the interview results and existing econometric and statistical forecasts. We have prepared no independent statistical or econometric forecast; and,
- o Our original terms of reference indicated that our forecast of demand for skilled labour would be based upon our interview results and by extrapolating the current skills mix for the industry. We understood that reasonable data regarding the existing skill mix had been gathered by the Canadian Machinery Equipment Manufacturers Association of Canada. This data subsequently proved to be less

than adequate. We have, therefore, at the instructions of the Task Force, prepared a questionnaire which we left with each of the companies we interviewed. The results of this questionnaire have been utilized in our analysis. They, of course, suffer from the same statistical limitations as the interview sample.

In view of the above limitations on the scope of our fact finding and analytical activities, and in view of deficiencies in existing data our report cannot be regarded as a definitive forecast. It represents the outlook for the Canadian Machinery and Equipment Industry and the related demand for skilled labour as derived from a synthesis of the views of some of the industry's major companies. This syntheses together with the results of various independent macro-economic forecasts for the industry results in, we believe, an overview of the industry's future demand for skilled labour.

CONDUCT OF INTERVIEWS

The sample of companies interviewed was selected on a subjective basis and designed to provide a reasonable coverage of all major sectors of the industry. It was also designed to provide a mix of large and small companies and foreign and domestically owned firms. Interviews were requested with the chief executive officer of each company. In some instances we were directed to other officials within the company.

A structured interview guideline was used to conduct each interview. The guideline first asked the respondent to review the global outlook for his industry segment, to then consider the Canadian Industry in a global context, to review the implications of the industry outlook for labour demand and finally to discuss labour supply issues. The interview guideline is attached as Appendix A to this report. All interviews were conducted during February and March of 1981.

If credible forecasts of labour demand are to be made, then reliable basic labour force data must be assembled. Our questionnaire in no way compensated for the lack of a comprehensive description of the existing skill mix of the industry's labour force.



REPORT OUTLINE

The remainder of this report is divided into the following sections:

- o Industry Overview
- o Sectoral Outlooks
- o Overall Growth Forecast for the 1980's
- o Relationship of The Demand for Skilled Labour to Increases in Output
- o The Machinery and Equipment Industry's Demand For Skilled Labour
- o Is the Supply of Skilled Labour a Constraint to Growth?
- o Labour Supply Issues
- o Summary and Conclusions.

II - INDUSTRY OVERVIEW

INDUSTRY DEFINITION

The starting point for our analysis is the question of what constitutes the Machinery and Equipment Industry. The question of industry definition can be crucial to the issues under study. One source⁽¹⁾ suggests that "an industry consists of the group of firms making products or services which are close substitutes for each other". This means that strategic changes by one competitor will affect others in the group. Because substitution is inherently a matter of degree an issue arises in defining just how close the substitution must be and what dimensions that substitution is on.

Product substitution is inherently a question of degree. In addition substitution possibilities may also exist in manufacturing, distribution and other functional areas. For example, a firm producing square metal boxes may be able to readily switch to manufacturing rectangular metal boxes, though the two shapes are used for completely different applications. Thus firms producing square boxes and rectangular boxes are part of the same industry.

The above noted source favours a wide definition of an industry on the grounds that most strategic issues are better approached on that basis. It also cautions, however, that superficial analysis may result from defining the industry too broadly and that the "desirability of broad industry definition should not be taken as license to ignore important differences among segments within an industry."

(1) discussion follows Note on the Structural Analysis of Industries
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The Department of Industry Trade and Commerce defines the machinery sector as comprising "those companies engaged in the production of the wide range of machinery and equipment required by Canada's resources, processing, manufacturing and service industries. It covers all industrial and service industries machinery including mechanical equipment for power generation and agricultural equipment, but excluding electrical and transportation equipment".(2)

Such a definition is obviously broader than what would normally be encompassed under the earlier discussion of industry definition. At the direction of the Task Force and because the Department of Industry Trade and Commerce definition is in some sense the "standard" Canadian definition, we adopted this definition to define the boundaries of the sector for which we are forecasting the demand for skilled labour. In order to avoid the problem of superficiality it was then necessary to divide the sector into major segments. These segments, discussed in the following section, come closer to our general industry definition than does the overall definition of the machinery sector.

INDUSTRY SECTORS

As noted above we have divided the Machinery and Sector into its component segments. Any one of a number of breakdowns would have been possible but we have elected to adopt that utilized by the Department of Industry Trade and Commerce in their Canadian Machinery Industry Sector Profile. There are two major advantages to this approach:

1. This breakdown, in most instances, results in segments which share the major characteristic of a separate industry - the products of firms within the segments are generally substitutes for each other.

(2) Canadian Machinery Industry. Sector Profile prepared for the Sector Task Force in the Canadian Machinery Industry



2. The Department of Industry Trade and Commerce has many useful statistics prepared on the basis of this particular segmentation.

The thirteen major segments of the industry and the products included in each are as follows:

1. Agricultural Equipment: includes all types of farm machinery.
2. Power Generation Equipment: power boilers, pressure vessels, heat exchangers, engines, turbines and transmission equipment.
3. Forestry Equipment: pulp and paper industries machinery, woodworking and sawmill machinery, and logging machinery.
4. Mining Machinery: mining and ore processing equipment and rock drilling and related equipment.
5. Construction Equipment: includes all types of construction equipment.
6. Special Industry Machinery: food and beverage products machinery, plastics and rubberworking machinery, textile industries machinery, printing and bookbinding machinery, packaging machinery and other special industry machinery.
7. Materials Handling Equipment: hoisting machinery, elevators and escalators, conveyors and conveying systems and other materials handling equipment.
8. Rolling Mill and Metalworking Equipment: foundry equipment and industrial furnaces, rolling mill and metalworking machinery and machine tools and tooling.
9. Pumps and Compressors: includes all types of pumps and compressors.



10. Other Industrial Machinery: valves, oil field production equipment, ventilating and dust collecting equipment, water and sewage treatment equipment, packaging machinery bearings and general purpose industrial machinery
11. Commercial Refrigeration: commercial refrigeration and air conditioning equipment.
12. Heating Equipment: includes all types of heating equipment.
13. Other Service Industry Equipment: plumbing equipment and sanitary ware, hand tools and hand operated power tools, chain saws, lawn movers, snow blowers and garden tractors, hardware, instruments and related products other service industries equipment and miscellaneous metal products.

In most cases the above breakdown results in a segment which lends itself to analysis. Segments six, ten and thirteen, however, are themselves comprised of many different products and could, if time and resources permitted, have been further segmented. Each of the thirteen segments are large and complicated industries and could justify a complete analytical effort.

GENERAL PROFILE

Data Sources and Data Types

All published data emanates from Statistics Canada. Different groups, however, manipulate this data in different ways. Three basic sets of data are available:

1. commodity statistics
2. industry statistics
3. corporation statistics



Commodity statistics are maintained on a much more disaggregated basis than either industry or corporation statistics. This causes some difficulties when attempting to ascribe industry or corporate characteristics to particular commodities or commodity groupings. Industry and corporation statistics differ in that for the latter the most basic unit is the firm (which may operate many plants and establishments) while the establishment is the unit used for industry statistics.

The segmentation used by the Department of Industry Trade and Commerce and adopted in this report are aggregations of commodity classes according to end use sector (eg. forestry) or application (eg. heating) of the equipment. These thirteen sectors although consisting of aggregations of commodity groups are themselves more disaggregated than the most basic industry classification groups. Commodity groups included in the Department of Industry Trade and Commerce sector definitions include commodities (eg. valves, heating equipment, hardware, tools, instruments and related equipment, boilers etc.) not included in the Statistics Canada "Machine Industries" group. Thus there are substantial differences between the total number of employees, establishments, etc., belonging to the Statistics Canada group "Machine Industries", and the DITC group "Machine Manufacturing Industries". The latter group contains almost double the number of establishments contained by the former.

The fact that the DITC "Machine Industry" transcends major Statistics Canada Industry classifications does not in itself present a problem. What does cause difficulties, however, is the fact that for several of the Statistics Canada groupings (eg. fabricated structural metal, and metal stamping and pressing) only a small portion of the output represents commodities defined by DITC as included in the Machinery and Equipment Industry. To arrive at industry totals for the number of employees, establishments etc., the DITC researchers weight the Standard Industrial Classification statistics to derive figures which relate to their defined segments.

As a result of the above statistical problems, the following statistical data which relates to the geographics of the industry, firm profitability and ownership is segmented according to the most disaggregated Standard Industrial

EXHIBIT I

MACHINERY INDUSTRY SHIPMENTS

	Shipments			1978(e)	% Average Annual Change			
	1965	1970	1975		1965-78	1965-70	1970-75	1975-78
	\$ Millions							
Agricultural Equipment	220.5	201.2	606.9	766.7	10.1	- 1.8	24.6	8.1
Power Generation Equipment	191.1	249.4	530.5	696.8	10.4	5.5	17.4	9.5
Forestry Equipment	130.3	204.8	339.7	433.1	9.7	9.5	15.2	8.4
Construction Equipment	73.4	86.5	192.2	266.4	10.4	3.3	21.0	11.5
Mining Machinery	60.5	85.6	167.8	192.5	9.3	7.2	11.3	1.1
Special Industry Machinery	153.1	354.4	452.6	655.8	11.8	18.3	7.8	13.2
Materials Handling Equipment	173.0	249.3	377.3	440.6	7.4	7.6	10.4	5.3
Rolling Mill, Metalworking	134.0	256.0	392.8	501.4	10.7	13.8	8.4	8.5
Pumps, Compressors	148.1	184.3	302.2	504.6	9.9	4.4	14.7	18.6
Other Industrial Machinery	84.9	128.6	199.5	364.8	11.9	8.7	11.3	22.3
Commercial Refrigeration	52.4	102.7	139.4	212.9	11.4	14.4	11.4	15.2
Heating Equipment	78.7	88.6	101.3	120.8	3.4	2.4	1.8	6.0
Other Service Industries	314.9	493.7	842.1	1,165.7	10.6	9.4	12.4	11.5
TOTAL	1,814.9	2,685.1	4,644.3	6,322.1	10.1	8.1	13.2	10.8
Gross National Expenditure								
Implicit Price Index					6.7	4.1	8.7	7.6

Source: Statistics Canada/DITC



Classification categories available. This approach provides an appreciation of the variances among different segments belonging to the industry. When using that data which has not been manipulated by DITC, however, it should be remembered that absolute numbers of total industry activity cannot be obtained from summing up the numbers for each industry group listed. In many cases only a portion of the basic industry group shown belongs to the Machinery Manufacturing Sector as defined by DITC and analyzed by later sections of this report.

There is one major complete omission in the data coverage: a breakdown of the labour skills utilized for either the industry as a whole (however defined) or for particular segments of the industry.

Machine Industry Shipments

Overall actual industry shipments for the segments as defined by DITC are shown in Exhibit I, opposite, for the years 1965, 1970, 1975 with estimates for 1978. As Exhibit I demonstrates, the different segments have experienced significantly different growth rates over the period ranging from a low average annual increase of 3.4 per cent for Heating Equipment to 11.9 per cent per annum for Other Industrial Machinery. It should be noted that all the figures shown in this and subsequent exhibits are nominal after inflation unless otherwise indicated. Approximate changes in the gross national expenditure price deflator for the same periods are indicated on the bottom of Exhibit I, opposite.

In addition, Exhibit 1 demonstrates that the different segments differ greatly in the fluctuations of their output. Agricultural Equipment for example, experienced a negative average annual rate of growth of 1.8 per cent between 1965 and 1970 and positive growth averaging 24.6 per cent per year from 1975 to 1970. For Materials Handling Equipment, on the other hand, the rate ranged from 5.3 per cent to 10.4 per cent.

EXHIBIT II

Machinery Trade By Major Machinery Producing Countries

<u>Country</u>	% of Domestic Requirements	Production
	<u>Imported</u>	<u>Exported</u>
U.S.	10	17
Japan	10	24
West Germany	34	63
Britain	34	50
France	50	45
Sweden	50	54
Canada	60	30

Source: 1973 Market Data/DITC

EXHIBIT III

MACHINERY AND EQUIPMENT

DOMESTIC MARKET

	Domestic Market			% Average Annual Growth		
	1965	1970	1975	1978	1965-78	1970-75
		\$ Millions				
Agricultural Equipment	383.3	298.1	1,142.9	1,450.8	10.8	30.8
Power Generation Equipment	301.6	341.3	788.0	1,106.1	10.5	18.2
Forestry Equipment	158.1	247.4	420.7	485.3	9.0	11.2
Mining Machinery	88.6	130.2	248.6	289.2	9.5	13.8
Construction Equipment	248.4	253.7	737.2	864.3	10.1	23.8
Special Industry Machinery	297.9	562.5	831.4	1,139.7	10.9	8.1
Materials Handling Equipment	236.3	323.0	603.4	618.8	7.8	13.3
Rolling Mill, Metalworking ⁽¹⁾	304.7	472.3	735.0	878.3	8.5	9.2
Pumps, Compressors ⁽²⁾	259.2	330.7	605.8	844.6	9.5	12.9
Other Industrial Machinery	135.6	223.1	358.7	708.4	13.6	10.0
Commercial Refrigeration ⁽³⁾	100.5	166.8	277.2	410.9	11.4	10.7
Heating Equipment	84.2	97.3	116.8	139.9	4.0	3.7
Other Service Industries	550.9	801.2	1,561.9	2,193.5	11.2	14.3
TOTAL	3,149.3	4,247.6	8,427.6	11,129.8	6.2	14.7

Source: Statistics Canada/DITC

- (1) Rolling Mill, Metalworking and Machine Tools.
- (2) Pumps, Compressors, Valves and Bearings.
- (3) Commercial Refrigeration and Air Conditioning Equipment.



Foreign Trade and the Canadian Market(3)

The predominant characteristic of machinery markets is that they are international. Most industrialized countries have strong machinery producing capabilities and they compete extensively with each other for the broad range of machinery needs characteristic of developed economies. They also compete in third countries which have little or no indigenous production capabilities.

The major machinery manufacturing countries such as the United States, Japan and West Germany, import machinery to some degree to meet the requirements of their domestic markets, and export some proportion of their domestic production. This reflects the widely diverse and highly competitive nature of machinery markets and to some extent, the importance of multinationals who, in many cases, have rationalized their production on a worldwide basis.

The extent to which machinery and equipment trade is carried on by all machinery producing countries is illustrated in Exhibit II, opposite. As Exhibit II illustrates, the Canadian industry is particularly "open" importing a larger portion of its requirements than the other major producing nations while exporting a somewhat lower portion of its total production than several other producing nations. This reflects the fact that the Canadian market encompasses a broad and diverse range of machinery needs while the demands for each type and size of machine are much lower in volume than is the case in a number of countries that are major machinery producers.

The domestic market for machinery and equipment products grew at an average nominal annual rate of 10.2 per cent between 1965 and 1978. As Exhibit III, opposite, indicates, however, this growth has not been spread equally across the major segments with average nominal annual rates ranging from 4.0 per cent in the heating equipment industry to 13.6 per cent in the Other Industrial Machinery category.

(3) This section follows Canadian Machinery Industry Sector Profile, Op Cit.

EXHIBIT IV

DOMESTIC SHIPMENTS AS A PERCENTAGE OF DOMESTIC MARKET

	1965	1970	1975	1978	% Average Annual Change			
	%	%	%	%	1965-78	1965-70	1970-75	1975-78
Agricultural Equipment	15.3	12.4	5.7	11.1	- 2.4	- 4.3	-14.4	24.9
Power Generation Equipment	60.0	54.8	52.8	47.7	- 1.7	- 1.8	- 0.7	- 3.3
Forestry Equipment	69.6	53.5	44.8	33.7	- 5.4	- 5.4	- 3.5	- 9.1
Mining Machinery	48.8	42.6	33.4	26.7	- 4.5	- 2.7	- 4.7	- 7.2
Construction Equipment	22.8	21.4	12.6	8.8	- 6.9	- 1.3	-10.1	-10.9
Special Industry Machinery	39.8	48.8	35.8	34.0	- 1.2	4.2	- 6.0	- 1.7
Materials Handling Equipment	64.2	66.0	50.1	50.3	- 1.9	0.5	- 5.4	0.1
Rolling Mill, Metalworking	38.2	45.7	40.6	38.5	0.1	3.6	- 2.4	- 1.7
Pumps, Compressors	50.8	42.4	31.9	37.1	- 2.4	- 3.7	- 5.5	5.2
Other Industrial Machinery	60.8	54.2	44.8	45.4	- 2.2	- 2.3	- 3.7	0.4
Commercial Refrigeration	52.1	60.1	49.1	51.2	- 0.1	2.9	- 4.0	1.4
Heating Equipment	89.9	88.6	83.0	80.8	- 0.8	- 0.3	- 1.3	0.9
Other Service Industries	49.2	47.2	40.1	33.5	- 2.9	- 0.8	- 3.2	5.8
TOTAL	46.0	46.9	35.1	33.7	- 2.4	0.4	- 5.6	- 1.3

Source: Statistics Canada/DITC

EXHIBIT V

MACHINERY INDUSTRY IMPORTS

	Imports			% Average Annual Growth					
	1965	1970	1975	1978(e)	1965-78	1965-70	1970-75	1975-78	
	\$ Millions								
Agricultural Equipment	324.6	261.2	1,077.3	1,289.4	12.8	- 4.3	32.8	6.2	
Power Generation Equipment	120.6	154.1	371.9	578.0	11.9	5.0	19.3	15.8	
Forestry Equipment	48.0	115.0	232.3	321.9	17.1	19.1	15.1	11.5	
Mining Machinery	45.3	74.7	165.6	212.1	13.8	10.5	17.2	8.6	
Construction Equipment	191.7	199.5	644.4	787.4	12.9	0.8	26.4	6.9	
Special Industry Machinery	179.2	288.2	533.4	752.6	12.9	0.8	26.4	12.2	
Materials Handling Equipment	84.6	110.0	301.1	307.6	13.5	5.4	22.3	0.7	
Rolling Mill, Metalworking	188.3	256.4	427.2	539.8	8.8	6.4	11.3	8.1	
Pumps, Compressors	127.6	190.5	412.5	513.4	12.4	8.3	16.7	8.8	
Other Industrial Machinery	53.1	102.1	197.8	386.8	14.1	14.1	14.1	25.1	
Commercial Refrigeration	48.1	66.6	141.1	200.4	11.4	6.7	16.2	12.4	
Heating Equipment	8.5	11.1	19.8	26.8	8.8	5.5	12.3	10.6	
Other Service Industries	279.6	423.4	945.5	1,439.7	12.8	8.6	17.2	15.0	
TOTAL	1,699.2	2,252.8	5,469.9	7,373.9	12.4	5.8	19.4	10.4	

Source: Statistics Canada

EXHIBIT VI

CANADIAN IMPORTS OF MACHINERY - SELECTED SECTORS
U.S. EXPRESSED AS A % OF TOTAL

	<u>Year</u>	<u>% From United States</u>
Agriculture	1979	88.7
Equipment	1976	88.9
Power Generator	1979	69.5
	1976	69.8
Materials Handling	1979	83.8
	1976	83.2
Mining Equipment	1979	88.2
	1976	84.1
Pumps and Compressors	1979	81.2
	1976	84.7
Const. Equipment	1979	90.5
	1976	91.7
Metal Working Equip.	1979	70.6
	1976	73.6
Other Industrial	1979	74.7
Machinery	1976	76.5
General Purpose	1979	73.0
Machinery	1976	73.6

Source: Statistic Canada 65-001
(Based on selected commodities within each sector)

EXHIBIT VII

MACHINERY INDUSTRY EXPORTS

	Exports			1978(e)	% Average Annual Change		
	1965	1970	1975		1965-78	1970-75	1975-78
	\$ Millions						
Agricultural Equipment	161.8	164.3	542.3	605.3	10.7	0.3	3.8
Power Generation Equipment	10.1	62.2	114.4	168.7	24.2	43.8	13.8
Forestry Equipment	20.2	72.4	151.3	269.7	22.1	29.1	21.3
Mining Machinery	17.2	30.1	84.8	115.4	15.7	11.8	10.8
Construction Equipment	16.7	32.3	99.4	189.5	20.5	14.1	24.0
Special Industry Machinery	34.4	80.1	154.6	268.7	17.1	18.4	20.2
Materials Handling Equipment	21.3	36.3	75.0	129.4	14.8	11.1	19.9
Rolling Mill, Metalworking	17.6	40.1	95.0	162.9	18.7	17.9	19.7
Pumps, Compressors	16.5	44.1	108.9	191.4	20.7	21.7	20.7
Other Industrial Machinery	2.4	7.6	38.6	43.2	24.5	25.9	3.8
Commercial Refrigeration	n.a.	2.5	3.3	2.4	n.a.	n.a.	-10.1
Heating Equipment	3.0	2.4	4.3	7.7	7.5	- 4.4	21.4
Other Service Industries	43.6	115.9	215.7	411.9	18.9	21.6	24.1
TOTAL	364.8	690.3	1,686.6	2,566.2	16.1	13.6	15.0

Source: Statistics Canada

EXHIBIT VIII

DISTRIBUTION OF CANADIAN EXPORTS

<u>SECTOR*</u>	<u>YEAR</u>	<u>TOTAL SHIPMENTS</u> \$MM	<u>% SHIPPED TO</u>		<u>JAPAN</u>	<u>OTHER</u>
			<u>U.S.</u>	<u>E.E.C.</u>		
Agriculture	1979	848	93.3	2.4	0.2	4.1
Equipment	1976	538	90.5	2.0	0.1	7.4
Power Generator	1979	225	46.0	3.0	0.2	50.8
Equipment	1976	85	57.6	4.7	0.4	37.3
Forestry Equipment	1979	112	42.0	37.5	0.3	20.2
(Woodworking)	1976	53	52.4	25.8	1.3	20.5
Construction Equipment	1979	159	59.6	6.8	0.3	33.3
	1976	66	34.8	8.3	0.2	56.7
Mining Equipment	1979	229	61.0	6.1	0.2	32.7
	1976	118	42.0	9.3	0.3	48.4
Special Industry	1979	412	66.7	2.5	3.1	27.7
	1976	177	70.1	6.1	0.3	23.5
Metal Working Mach.	1979	195	80.5	6.1	3.3	10.1
	1976	75	68.2	6.9	0.63	24.3
Materials	1979	277	81.0	3.8	0.2	15.0
Handling	1976	136	70.5	4.3	1.3	23.9
General	1979	346	61.7	5.8	0.3	32.2
Purpose	1976	166	60.2	7.8	0.5	31.5
Machinery						
Commercial	1979	94	67.4	3.5	0.1	29.0
Refrigeration and						
Heating	1976	37	55.8	7.0	0.5	36.7
SERVICE	1979	400	75.0	7.5	2.0	15.5
(Tools and Other						
Equipment)	1976	170	68.0	6.8	3.1	22.1

* Based on representative commodities within sector, if entire commodity spectrum not readily available. Total shipments correspond to shipments of commodities selected.

Source: Calculated from Material published in Statistics Canada 65-001



Through the 1965-1978 period domestic production lost market share to imports in every segment of the industry with the exception of Rolling Mill, Metalworking. This is illustrated in Exhibit IV, opposite. This growth in imports is shown in Exhibit V, opposite.

The main source for imports of machinery and equipment is the United States. The importance of the United States as a supplier is shown, for selected segments, in Exhibit VI, opposite. In almost every instance the bulk of the remaining imports are from Europe.

Exports of Canadian Machinery and Equipment products also grew rapidly over the 1965-1978 time period. The distribution of exports across the industry segments and the different growth rates are shown in Exhibit VII, opposite. Overall the United States is by far the major customer for Canadian exports taking 71.5 per cent of machinery and equipment exports in 1978 followed by Britain, a distant second with 2.4 per cent. The remaining quarter of Canadian exports are sold throughout the world. The relative importance of the United States market does, however, vary by sector. Exhibit VIII, opposite, illustrates the importance of major markets for selected commodity groupings. Total shipments will not agree with those in previous Exhibits because of the data difficulties discussed above.

Tariff and Non-Tariff Trade Barriers

Over the years Canadian tariff policy has attempted to reconcile two competing objectives:

- o Encourage the development and growth of the machinery industry; and,
- o Reduce the cost of capital equipment to users.

In 1936 the principal machinery tariff item was divided into two parts, with a reduced rate of 20 per cent for machinery of a "class or kind not made in Canada" and 25 per cent for machinery of a "class or kind made in

EXHIBIT IX

OWNERSHIP PATTERNS

INDUSTRY	% of Domestic Shipments by Establishments under Foreign Control		% of Assets Under Foreign Control		% of Establishments Under Foreign Control	
	<u>1974</u>	<u>1976</u>	<u>1975</u>	<u>1977</u>	<u>1974</u>	
Machine Manuf.			67.0	64.0		
Agricultural Implements	30.6	27.4	41.9	39.0	6.1	
Misc. Machinery & Equip.	68.9	72.4			29.1	
Office & Store Machinery	82.9	90.0	76.1	73.3	46.4	
Commercial Refrigeration	49.7	59.0	71.7	60.0	33.3	
Other						
Boiler & Plate Works	62.6	65.9	79.3	68.8	15.3	
Fabricated Structural Metal	8.0	13.9	12.9	10.7	4.8	
Hardware, Tool, & Cutlery	51.1	51.8	52.9	33.2	11.0	
Heating Equipment	52.1	51.5	37.0	49.9	32.8	
Misc. Metal Fabricating	43.6	42.5	52.5	53.2	21.2	
Metal Stamping & Pressing	60.5	—	60.3	54.8	15.7	
Industrial Electrical Equip.	88.1	89.0	94.0	92.9	52.6	
Science & Professional Instruments	88.5	97.1	79.9	79.2	35.4	
All Manufacturing Industries	51.0	*	*	*	12.4	
All Industries	*	*	32.9	*	*	

* data unavailable

Source: Statistics Canada

EXHIBIT X

INDUSTRY PROFITABILITY

INDUSTRY	<u>1977</u>		<u>1976</u>		<u>1975</u>		<u>1974</u>	
	R.O.A. %	R.O.E. %	R.O.A. %	R.O.E. %	R.O.A. %	R.O.E. %	R.O.A. %	R.O.E. %
Agricultural Implements	6.5	4.6	10.8	14.2	12.0	17.8	10.3	15.3
Commercial Refrigeration	8.6	16.5	10.4	19.3	7.3	13.4	7.6	14.8
Other Machinery	6.6	11.5	7.7	13.8	8.2	15.5	7.5	14.5
Total Machinery	6.7	9.9	8.6	14.1	9.2	16.1	8.2	15.0
Boiler & Plate	6.5	14.0	8.1	18.4	6.6	18.5	6.0	14.9
Structural Steel	5.0	7.9	6.5	13.4	9.2	21.3	8.1	19.9
Hardware & Tools	10.9	16.3	8.7	13.6	10.0	15.7	10.9	19.4
Heating Equipment	7.4	10.0	10.4	18.4	8.7	12.1	8.2	15.4
Misc. Metal Products	8.0	13.2	9.1	15.4	10.7	20.6	11.2	23.8
Industrial Elect. Equip.	7.0	10.9	7.3	12.2	7.5	13.8	6.1	10.4
Scientific & Professional Equip.	9.3	14.0	8.7	14.0	8.8	14.6	7.4	11.2
All Manufacturing	6.9	10.6	7.4	11.6	7.6	12.6	9.1	16.2
All Industries	7.4	12.1	7.5	12.6	7.4	13.0	7.9	15.0

R.O.A. = RETURN ON ASSETS

R.O.E. = RETURN ON EQUITY

SOURCE: Statistics Canada; CIBC "Capital at Work".



Canada"(4). In 1951 these rates were reduced to 7.5 per cent and 22.5 per cent respectively and remained at these levels until the 1968 Kennedy Round of tariff reductions.

Under the Kennedy Round, the Canadian tariff on most machinery was reduced from 22.5 per cent to 15 per cent. This coincided with the introduction of the "Machinery Program" which provided for duty assessments to be remitted in individual cases when machinery is "not available in Canada". Subsequent changes to Canadian tariff policy as it relates to individual segments is discussed in Section III, following this report. In general, most interviewees do not regard existing tariffs or changes under the Toyko Round of discussions as a major factor in the Canadian industry's future development.

Prior to the Kennedy Round the relatively high tariffs on the bulk of imported machinery of a "class or kind made in Canada" were instrumental in the establishment of Canadian branch plants designed to service domestic requirements. Following the Kennedy Round, the relative importance of tariffs as a restraint to machinery trade declined and while the Canadian tariff remains relatively high in comparison to other industrialized countries the average rate of duty taking into account the duty remissions under the Machinery Program is significantly lower than the posted rates. In addition, the industry receives little or no protection over a wide range of resource machinery and most agricultural equipment enters Canada duty free.

The principal forms of general non-tariff barriers to Canada's exports noted by DITC relating to the industry as a whole include:

- o Foreign tied or concessional financing advantages enjoyed by foreign suppliers in respect of large Canadian capital projects;

(4) From Canadian Machinery Industry Sector Profile op. cit.

For individual segment picture see Section of this report.



- o Government procurement policies such as "Buy America" legislation and the policy of certain European countries to not consider foreign suppliers in such areas as power equipment, water and sewage treatment equipment, petrochemical, oil and gas and pipeline equipment; and,
- o "Local content" provisions imposed in certain countries as a condition for Canadian suppliers to obtain contracts.

Ownership Patterns

There is a significant foreign ownership component in the Canadian Machinery and Equipment Industry. It does, however, vary considerably from segment to segment. Exhibit IX, opposite, provides figures as to the percentage of domestic shipments, assets and establishments under foreign ownership. For every segment the percentage of domestic shipments and assets controlled by foreigners is greater than the percentage of establishments so controlled. This would indicate that the larger establishments are more likely to be foreign controlled leaving the smaller operations in domestic hands.

Ownership patterns can have important implications for labour demand. Foreign owned firms are usually in a much better position to rationalize production and shift production in response to factor availability.

Industry Profitability

The Canadian Machinery and Equipment Industry has a generally better than average record of profitability. Profitability figures for four years in the mid 1970's are shown in Exhibit X, opposite. As the Exhibit demonstrates, the different segments of the industry have demonstrated different cyclical fluctuations in profitability.

EXHIBIT XI

GEOGRAPHIC DISTRIBUTION

1977

Total Machinery Industry as defined by I.T.C.

<u>REGION</u>	<u>ESTABLISHMENTS</u>		<u>SHIPMENTS</u>		<u>EMPLOYMENT</u>	
	#	%	\$M	%	#	%
Atlantic	48	2.4	21.3	0.4	720	0.6
Quebec	402	20.1	936.2	17.6	25,200	21.0
Ontario	1,090	54.5	3,510	66.0	74,280	61.9
Prairies	254	12.7	532	10.0	12,840	10.7
B.C.	206	10.3	319.7	6.0	6,960	5.8

SOURCE: DITC Section Profile

EXHIBIT XII

INDUSTRY STRUCTURE

CORPORATE CONCENTRATION IN SELECTED MACHINE MANUFACTURING INDUSTRIES

The Percentage of Total Industry Shipments
Accounted for by the Top Four Firms in the Industry*

<u>INDUSTRY GROUP</u>	<u>1978</u>	<u>1976</u>	<u>1970</u>	<u>1965</u>
Agricultural Implements	65.4	65.1	70.6	71.6
Misc. Machine and Equipment	8.9	11.0	16.1	15.0
Commercial Refrigeration	48.9	53.4	54.2	51.5
Office and Store Machinery	81.0	--	82.7	--
Boiler & Plate Works	63.7	--	55.3	49.1
Fab. Structural Metal	40.3	41.8	44.0	46.9
Hardware, Tool, and Cutlery	13.9	19.8	16.5	--
Heating Equipment	31.5	28.8	28.6	29.8
Misc. Metal Products	13.3	13.7	14.6	20.0
Instruments and Related Products	57.1	57.4	--	--

* 1978 preliminary figures from Mr. Young - Foreign Control

MAPID

Statistics Canada



Geographical Distribution

Approximately 85 per cent of machinery industry activity is concentrated in the urban centres of Ontario and Quebec. As Exhibit XI, opposite, indicates this distribution of shipments and employment is not exactly matched in the distribution of establishments. In general, it would appear that Ontario establishments are larger, in terms of both shipments and employment, than are those located in other regions of the country.

There is one major exception to the general pattern of distribution: Agricultural Machinery and Equipment. This segment has 32.1 per cent of its production, 29.6 per cent of its employees and 41.0 per cent of its establishments in the Prairie Provinces.

Industry Concentration

Exhibit XII, opposite, gives the percentage of total shipments accounted for by the top four firms for various segments of the Machinery and Equipment Industry. Once again the situation in the industry varies depending on the particular segment under consideration. For most segments of the industry the degree of concentration has been decreasing in recent years. This probably reflects the diverse nature of products by this industry, and the increasing specialization of firms in particular products.

Industry Employment

As noted above detailed figures as to employment by skill category for the various segments of the industry are not available. DITC indicates that in 1975 employment in the machinery industry reached an estimated 120,000 wage and salary earners, approximately 7 per cent of total manufacturing employment in Canada. A significant proportion of the jobs were considered to be professional or skilled occupations. From 1946 to 1975 employment in the industry increased at an average of 2 per cent per year.

General Forecasts

Several forecasts have been made regarding the overall future of the Machinery and Equipment Industry. All tend to agree that the medium- to long-term outlooks for the industry is optimistic and that the growth in markets for this industry will probably exceed that for the economy as a whole. There is some question, however, as to what portion of this growth will be supplied by Canadian producers. In the September 1980 issue of Canadian Machinery and Metalworking Magazine the following two projections were discussed:

1. "A MEMAC (Machinery and Equipment Manufacturers Association of Canada) study forecasts that by 1985 the domestic machinery market will be \$30.8 billion in current dollars (18.6 billion in 1979 dollars) for a real six year growth of 54%. The same study also predicts that importers will supply 22.8 billion dollars (13.8 billion 1979 dollars) of this machinery with only 8.0 billion going to domestic firms..... The industry sent 54 per cent or \$3.4 billion of its shipments to the export market in 1979. MEMAC believes that given the continued prospect of an 85 cent dollar and the more aggressive foreign sales attitude now evident this will grow to \$8.7 billion (\$5.3 billion in 1979 dollars) by 1985 representing a real growth of 56 per cent ... now providing 155,000 direct jobs.
2. With comments from the Department of Industry, Trade and Commerce, John P. Reny, Director of Machinery and Equipment Advisory Board discusses the industry's status:
"... New development in areas related to energy, resource exploration, transportation and urban needs, the growth of the service sector, as well as the general need to improve productivity levels throughout industry should provide the main stimulus to growth in the machinery sector. In this regard the domestic market for machinery is projected to grow at an average annual rate of about 5 per cent in real terms, to reach \$13.5 billion (1977 dollars) by 1985 ... At the same time, current projections of world machinery demand to 1985 suggest that Canadian exports will be some \$3.7 billion, representing an average growth rate of about 8 per cent in real terms during the next five years ..."



In a report prepared for the Task Force, David Choo of Computational Methods Ltd. outlined the impact of two different scenarios for the general economy on the machinery sector. The first scenario assumed a low energy price policy, and the second a high energy price policy. Macro economic model runs were performed by Informetrica and included the investments in "mega" projects, with appropriate adjustments under the two energy price scenarios. The average annual growth rates in the industry's real domestic product for the high energy policy and low energy policy cases were 7.5 per cent and 8.3 per cent respectively through to 1985.

All three forecasts discussed above, therefore, indicate that the overall prospects for the industry are favourable. The impact of this overall growth on the industry's demand for skilled labour depends on many different factors including the growth rates for the different sectors and the relationship between growth of output and the requirements for labour impact. These topics are discussed in the following sections of this report.



III - SECTORAL OUTLOOKS

In this section of the report we address each individual sector of the Canadian machinery and equipment industry by analyzing the markets, outlining the trends and describing the outlook for each sector. This then leads us to a growth forecast based on our analysis of interviews with manufacturers in each industrial sector.

In the course of our work it was necessary to assume an average annual Canadian growth rate for the general level of economic activity during the period of 1980-1990. In doing this we reviewed the GNP projections of a number of leading forecasters in government, business and academic circles including the following:

- o Department of Finance;
- o Economic Council of Canada;
- o Ontario Economic Council;
- o Major Economic Forecasting Groups;
- o Major Banking and Investment firms.

It should be recognized that economic forecasts are predicated by several important assumptions and that any variation in these key assumptions can greatly influence the forecast. Many companies interviewed indicated that their predictions for the future are based on certain assumptions regarding government policy and G.N.P. growth rates. The critical assumptions that have been recognized are:

- o U.S. and world economic growth;
- o Canadian exchange rate;
- o government spending;
- o monetary policy;
- o oil prices;
- o demographic changes.

EXHIBIT XIII

AGRICULTURAL EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	220.5	161.8	324.6	383.3	15.3
1970	201.2	164.3	261.2	298.1	12.4
1975	606.9	541.3	1,077.3	1,142.9	5.7
1978(e)	766.7	605.3	1,289.4	1,450.8	11.1
	% Average Annual Change				% Average Annual Change
1965-78	10.1	10.7	12.8	10.8	- 2.4
1965-70	- 1.8	0.3	- 4.3	- 4.9	- 4.3
1970-75	24.6	26.9	32.8	30.8	-14.4
1975-78	8.1	3.8	6.2		24.9

Source: Statistics Canada



Using the forecasting sources mentioned we have assumed the following real growth rate:

- o G.N.P. + 3.5%

There is a general consensus that the manufacturing sector as a whole is likely to increase at about the same rate as the GNP increase. However, the machinery and equipment industry is expected to experience above average growth arising mainly from the forecast increase in business fixed investment and from better export performance.

Although it excludes electrical and transportation equipment the machinery and equipment industry includes a wide range of products used by resource, processing, manufacturing and service industries which necessitates an individual examination of each segment of this broad, diversified and important industry.

AGRICULTURAL EQUIPMENT

This segment includes machinery and equipment used in agriculture such as tractors, implements, combines, cultivators, seeding equipment, and harvesting machinery.

Market Analysis

Exhibit XIII, opposite, which charts industry shipments, exports, imports, and the apparent domestic market demonstrates the cyclical nature of this industry. The cycle for this industry does not follow GNP in any particular fashion. In the free market economies of the world, the prime factors influencing the markets for agricultural equipment relate to net farm income and commodity prices. Underlying causes which influence the fortunes of this industry are the weather, world food stocks and on the supply side the crop cycle and longer livestock cycle.

EXHIBIT XIV

AGRICULTURAL EQUIPMENT MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	93.3	90.5	88.7	88.9
E.E.C.	2.4	2.0	n.a.	n.a.
Japan	0.2	0.1	n.a.	n.a.
Other	4.1	7.4	n.a.	n.a.

Source: Statistics Canada



The Canadian industry was supplying a lesser and lesser amount of the domestic market until the latter half of the 1970's as is shown in Exhibit XIII. This recent turnaround can be partly attributed to the growing success of the prairie equipment manufacturers producing implements and large four-wheel drive tractors. The industry on the prairies is becoming more aggressive and currently holds 15% of the prairie market.

Exhibit XIV, opposite, highlighting the distribution of Canadian exports identifies the U.S. market as the area where prairie manufacturers have been most successful. The larger U.S. share of exports has also resulted from the high acceptance of combine harvesters made by major multinational corporations manufacturing in Canada.

There is an overwhelming amount of imports supplied from the U.S. and a growing amount from Japan in the form of small tractors.

Trends

In the developed countries of the world farm rationalization will continue. In the U.S. the average farm size has now increased to 440 acres while the number of farms has decreased to 2.3 million, the lowest since 1860. This trend toward larger farms coupled with higher labour costs is leading to the demand for more efficient and sophisticated farm machinery. Although upgraded equipment results in higher dollar volumes, physical volumes will have to decrease leading to further production rationalization.

The product changes in this industry will take the form of increased sizes and of better control systems to insure the most economical and efficient operation. However, the industry is considered mature and the rate of technological change will be relatively slow with the exception of the rotary combine which harvests using axial-flow cylinders as opposed to the traditional longitudinal conveyor belt system. Newer and larger cultivating and seeding machines will be developed to efficiently match the new high powered tractors.



In the developing nations of the world there is great potential but political and financial constraints will continue to make these markets somewhat unpredictable. As markets in the third world do open up there will be greater pressure from these nations to locate production facilities there.

Outlook

World competition for the agricultural equipment market will increase and become more severe as the firms of the world will be competing for fewer and fewer unit volumes. At the same time, countries such as Japan, Germany, France, Italy, and Czechoslovakia will turn their attention more to world markets as their home markets become mature. This interaction of demand and supply factors leads to a cautious and conservative outlook for this industry. The future of this industry does not relate to the fluctuations of the gross national product but to a complex interaction between cycles in the developed world and political and financial motivations in the third world.

Forecasting future sales in the industry is usually accomplished through relating past historical data to forecasts of net farm income and commodity prices in the developed world and through the maintenance of close contact with the realities of the political and socio-economic environment in the developing countries.

Over the next decade imports are forecast to maintain their market share in Canada while exports as a percent of domestic shipments are predicted to increase somewhat as Canadian manufacturers become more successful in the U.S.

Growth Forecast

- o Canadian shipments + 3.0%

EXHIBIT XV

POWER GENERATION EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				% <u> </u>
1965	191.1	10.1	120.6	301.6	60.0
1970	249.4	62.2	154.1	341.3	54.8
1975	530.5	114.4	371.9	788.0	52.8
1978(e)	696.8	168.7	578.0	1,106.1	47.7
	% Average Annual Change				% Average Annual Change
1965-78	10.4	24.2	11.9	10.5	- 1.7
1965-70	5.5	43.8	5.0	2.5	- 1.8
1970-75	17.4	12.9	19.3	18.2	- 0.7
1975-78	9.5	13.8	15.8		- 3.3

Source: Statistics Canada



POWER GENERATION EQUIPMENT

This industry is primarily engaged in the manufacture of hydraulic and mechanical power transmission equipment, turbines, power boilers, pressure vessels, heat exchangers, and engines.

Markets Analysis

Exhibit XV, opposite, containing industry shipments, trade and domestic market size shows a moderate increase in the Canadian industry's output as a result of good export performance but weak results in the growing domestic market. To expand their operations, Canadian firms have sought world markets but in so doing have found it necessary to specialize their product offerings in order to compete on a cost and technological basis. While this specialization has lead to increased world opportunities it has also opened up Canada to imports as this country has broad and diverse needs.

Exhibit XVI, following, dramatically exemplifies the success of Canadian exports. As shown in this exhibit, the other category which represents developing countries accounted for over 50% of Canadian exports in 1979 as compared to 37% in 1976. Canadian firms have been successful in countries such as Libya, Mexico, Brazil, Thailand, the U.K., and many others.

A substantial proportion of the imports into Canada arise from the U.S. and a contributing cause is the need by multinational oil companies for more sophisticated technology than the Canadian industry can offer.

The end-users of the products of this industry are usually related to energy and so in the industrialized countries of the world, customers are the oil and gas companies and suppliers to the oil and gas firms.

The competing countries such as the U.S., Japan and Germany are active in both the domestic and export markets.

EXHIBIT XVI

POWER GENERATION EQUIPMENT MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	46.0	57.6	69.5	69.8
E.E.C.	3.0	4.7	n.a.	n.a.
Japan	0.2	0.4	n.a.	n.a.
Other	50.8	37.3	n.a.	n.a.

Source: Statistics Canada



Trends

The power generation equipment industry in Canada has been successful as a result of world product mandating and of the transfer of technology to Canadian operations. Hydraulic and gas turbines are good examples. A recent trend and one that will continue into the 1980's is the increasing amount of research and development that these firms are devoting to both world mandates and separate Canadian technology.

Markets are becoming more competitive and many countries support and in some cases subsidize their domestic firms. The Italian and French governments are note-worthy for providing a great deal of support to their industries.

Much of the business in the third world has and will continue to arise through subcontracting by the international consulting engineering firms. Once a project in a developing country is given approval and a prime contractor is selected the granting of subcontracts can be a function of the nationality of the prime contractor. Consulting engineering firms in countries such as West Germany, France, and Japan will often specify equipment originating from their own respective countries. This process is quite in contrast with North American firms which call for bids on sub-contracts from all countries. This nationalistic trend is seen as increasing with perhaps the U.S. and Canada following suit.

New markets will continue to open up in the 1980's in areas of the third world where petroleum development and infrastructure are required. Of special note are countries belonging to O.P.E.C. such as Libya and Mexico where oil wealth will drive development. In general, Latin American and North African countries will offer potential during the next decade. As Canada becomes a leader in nonconventional hydrocarbon resource extraction, this industry has a good opportunity to supply products for future world requirements.

EXHIBIT XVII

FORESTRY EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				%
1965	130.3	20.2	48.0	158.1	69.6
1970	204.8	72.4	115.0	247.4	53.7
1975	339.7	151.3	232.3	420.7	44.8
1978(e)	433.1	269.7	321.9	485.3	33.7
	% Average Annual Change				% Average Annual Change
1965-78	9.7	22.1	17.1	9.0	- 5.4
1965-70	9.5	29.1	19.1	9.4	- 5.4
1970-75	15.2	15.9	15.1	11.2	- 3.5
1975-78	8.4	21.3	11.5		- 9.1

Source: Statistics Canada



Since production rationalization has already occurred in this industry and since some of the products of this segment are custom (made to order) there will be few structural changes that will occur in the 1980's.

Outlook

Demand for power generation equipment does not move in any relationship to the business cycle but responds to the construction of major energy projects which is a function of government policy and private investment decisions.

Forecasts of the shipments for this industry can be quite vulnerable as forecasts depend upon the realization of a relatively few number of successful bids for projects both at home and abroad. Over the next decade exports are likely to increase both to the U.S. and the third world, while imports will also increase.

Growth Forecasts

- o Canadian shipments + 5.0%

FORESTRY EQUIPMENT

This segment of the machinery industry includes those firms making machinery and equipment for the pulp and paper, woodworking, sawmill, and logging industries.

Markets Analysis

Exhibit XVII, opposite, indicates that the shipments of this industry have grown moderately because of large increases in exports. Even though the growth rate of imports has been lower in recent years, Canadian manufacturers have continued to lose share in the domestic market.

EXHIBIT XVIII

FORESTRY EQUIPMENT MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	42.0	52.4	83.8	83.2
E.E.C.	37.5	25.8	n.a.	n.a.
Japan	0.3	1.3	n.a.	n.a.
Other	20.2	20.5	n.a.	n.a.

Source: Statistics Canada



The distribution of Canadian exports has recently been changing. As Exhibit XVIII, opposite, shows, Canadian firms have become very successful in the Scandinavian countries of the EEC. Competition for the Canadian market arises from the U.S., Sweden and Finland. In the export markets Brazil and Japan have recently become market participants.

Trends

As Canada is a major producer of forestry equipment, and as Canada is recognized as a leader in this industry, Canadian production tends to be rationalized.

During the 1980's there will be no new major sources of supply with possible exception of Japan which may make some gains in the third world countries.

Technological change in the forestry equipment industry will be directed towards faster and more energy efficient equipment.

Outlook

In general, the demand for forestry equipment lags the business cycle by 6-9 months as expansion decisions are usually made before the cycle turns down. Essentially, the demand for forestry equipment is driven by the demand of its end-uses such as newsprint, market pulp, and fine paper. However, in a number of countries of which Canada is a good example, expansion plans of the companies operating in the forestry and pulp and paper industries are influenced by government policies and incentives.

Sales forecasting in this industry is relatively sophisticated as representative firms assess market opportunities against the realities of the industry and competition. From a strategic perspective, firms plot their product and market development plans within their market potential.

EXHIBIT XIX

CONSTRUCTION EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				%
1965	73.4	16.7	191.7	248.4	22.8
1970	86.5	32.3	199.5	253.7	21.4
1975	192.2	99.4	644.4	737.2	12.6
1978(e)	266.4	189.5	787.4	864.3	8.8
	% Average Annual Change				% Average Annual Change
1965-78	10.4	20.5	12.9	10.1	- 6.9
1965-70	3.3	14.1	0.8	0.4	- 1.3
1970-75	21.0	25.2	26.4	23.8	-10.1
1975-78	11.5	24.0	6.9		-10.9

Source: Statistics Canada

EXHIBIT XX

CONSTRUCTION EQUIPMENT MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	59.6	34.8	90.5	91.7
E.E.C.	6.8	8.3	n.a.	n.a.
Japan	0.3	0.2	n.a.	n.a.
Other	33.3	56.7	n.a.	n.a.

Source: Statistics Canada



During the period of 1980-1990 the import of machinery into Canada will increase somewhat, while the exports of Canadian firms will increase at a greater rate. Export gains will result mainly from the expansion of the southern U.S. forestry and pulp and paper industry.

Growth Forecast

- o domestic shipments + 3.5%

CONSTRUCTION EQUIPMENT

Manufacturers of construction equipment are engaged in making products such as bulldozers, scrapers, loaders, cranes, and any other form of machinery which is used in the construction process.

Markets Analysis

Exhibit XIX, opposite, demonstrates that Canadian shipments of construction equipment has shown good growth resulting from buoyant exports. The domestic market has shown good growth over the years as well and imports have made significant penetration gains in Canada especially during the 1970-1975 period. Production rationalization which is occurring in this industry has led to this phenomenon. Exhibit XX, opposite, which is a historical comparison of the distribution of Canadian exports, indicates that production rationalization and more aggressive export marketing by Canadian firms has led to a greater penetration of the U.S. market.

The manufacturers comprising this industry sell to many market segments including highway, airport and harbour projects, residential and commercial building, mass transit, pipelines, and water and sewer projects. As markets have become subdivided, each individual subsector has developed its own needs resulting in a variety of end products which are quite diverse.



The major competitors for the domestic market are U.S. firms while for export markets, the U.S. as well as the Japanese are prevalent. Competing in the industrialized countries of Europe is difficult as there are a number of non-tariff barriers in these countries designed to protect domestic industry.

Trends

Production line methods are generally used in the manufacture of this equipment. With the application of a wide range of options the diverse market needs are met. For the very large equipment custom engineering is often required in order to meet the precise needs of the customer. In order to realize the economies of scale in production the major broadline manufacturers have begun and will continue to standardize and reduce the number of components that transcend the many product categories of this industry. This standardization and rationalization of components production on a world-wide basis will be located in strategic geographical positions around the world while at the same time manufacturers will locate the final assembly and finishing of equipment as close as possible to consuming markets.

From an industry perspective the need to participate fully in the world market and the resultant pressures to reduce cost by the adoption of production strategies which maximize the economies of scale will give a distinct advantage to the broadline manufacturer who can produce for all market segments. The clear trend therefore is towards the emergence of more and larger multinational corporations which strive to broaden their product lines further by investing in new production facilities or by acquiring short line companies which specialize in narrower product lines.

Technological change in this industry will be concentrated in the application of the microprocessor to the manufacturing process and to a lesser scale to specific applications in the product itself.

During the 1980's there will be new competitive threats from the Japanese as they are now starting to expand outside their traditional market areas.

EXHIBIT XXI

MINING MACHINERY MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				% <u> </u>
1965	60.5	17.2	45.3	88.6	48.8
1970	85.6	30.1	74.7	130.2	42.6
1975	167.8	84.8	165.6	248.6	33.4
1978(e)	192.5	115.4	212.1	289.2	26.7
	% Average Annual Change				% Average Annual Change
1965-78	9.3	15.7	13.8	9.5	- 4.5
1965-70	7.2	11.8	10.5	8.0	- 2.7
1970-75	11.3	23.0	17.2	13.8	- 4.7
1975-78	1.1	10.8	8.6		- 7.2

Source: Statistics Canada



Outlook

Fluctuations in the construction equipment industry can be great and demand is dependent on public and private investment levels.

To forecast sales, this industry evaluates the capital investment plans of governments and industry around the world.

Imports into Canada will increase in the next decade as tariffs are lowered and rationalization by multinational firms continue. At the same time this rationalization will help to boost Canadian exports.

Growth Forecast

- o domestic shipments + 4.0%

MINING MACHINERY

This industry includes equipment which is used in the extraction and processing of mines. Extraction machines include percussion rock drills, rotary face drills, cutting machines and augers. Haulage equipment includes shuttle cars, loaders, dumpers, mine cars and conveyors. Beneficiation equipment consists of crushers, grinders, classifiers, floatation equipment and dryers. Open pit equipment includes shovels, drag lines, and front end loaders.

Markets Analysis

Exhibit XXI, opposite, shows that shipments of the industry have been moderate and during the latter years of the 1970's have slowed significantly. Such growth as has been achieved has resulted from a good performance in exports while a growing level of imports has reduced the industry's market share in the domestic market. Exhibit XXII, following, indicates a greater dependence on trade with the U.S. as that country has come to represent a greater percentage of both Canadian exports and imports. Although the U.S.

EXHIBIT XXII

MINING EQUIPMENT MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	61.0	42.0	88.2	84.1
E.E.C.	6.1	9.3	n.a.	n.a.
Japan	0.2	0.3	n.a.	n.a.
Other	32.7	48.4	n.a.	n.a.

Source: Statistics Canada



has recently taken more Canadian exports, Peru, Mexico, Australia, Argentina, India, and countries of Mid-Africa and of eastern Europe still represent significant markets for Canadian manufacturers.

In the domestic market the major foreign competitors are the U.S., Sweden and Finland. The competing countries in the export markets are France, Japan, Finland, Sweden, Germany and Yugoslavia.

Trends

Sales of mining equipment will be stimulated by the growing need to mine lower grade ores as the higher grades are played out. The mining of low grade ores on a commercial scale requires high capacity extraction and haulage equipment. High volume beneficiation equipment is also needed to process low grade ores into concentrates or refine products which then can be economically transferred to smelters.

The extraction of metals and minerals is expected to increase during the next decade creating greater demands for mining machinery. The greater use of coal and uranium in particular, will stimulate demand.

In the 1980's, greater attention will be paid to the design and development of ocean mining machinery and equipment. Some of the techniques and equipment used by the off-shore oil industry can be expected to be modified to aid in the mining of metal and mineral nodules from the ocean floor.

Rationalization of production by the multi-national corporations will accelerate making Canada more and more a specialized producer. Competition can be expected to become keener as various firms throughout the world endeavour to produce more efficient equipment. As an example, Sweden is currently leading the world in hydraulic drilling machinery. In addition, countries such as South Korea with favourable labour rates and a developing industrial base will be able to compete in the future along price and quality parameters.

EXHIBIT XXIII

SPECIAL INDUSTRY MACHINERY MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				% <u> </u>
1965	153.1	34.4	179.2	297.9	39.8
1970	354.4	80.1	288.2	562.5	48.8
1975	452.6	154.6	533.4	831.4	35.8
1978(e)	655.8	268.7	752.6	1,139.7	34.0
	% Average Annual Change				% Average Annual Change
1965-78	11.8	17.1	12.9	10.9	- 1.2
1965-70	18.3	18.4	0.8	13.5	4.2
1970-75	7.8	14.1	26.4	8.1	- 6.0
1975-78	13.2	20.2	12.2		- 1.7

Source: Statistics Canada



Developing countries such as those located in Mid-Africa and the eastern block countries represent the greatest potential for new markets in the 1980's.

Outlook

The demand for mining machinery is primarily driven by the demand for metallic and non-metallic minerals which is created by manufacturing industries meeting the level of overall demand. The cycle for mining machinery usually lags the G.N.P. cycle by 6-12 months.

Sales forecasting techniques vary in their level of sophistication ranging from an international marketing approach to domestic sales force estimates.

As this industry continues its rationalization process, imports will increase and for the same reason exports will increase.

Growth Forecast

- o domestic shipments + 4.0%

SPECIAL INDUSTRIAL MACHINERY

This segment includes manufacturers which make machinery for the following industries: food and beverage, plastics and rubber working, textile, printing and book binding, packaging, and other special industries. As this is a broad categorization it is difficult to make universal generalizations about this segment; however, manufacturers in three subsegments will be discussed here.

Markets Analysis

Relatively high growth rates for industry shipments, exports, imports, and the domestic market have been experienced since 1965. These growth rates are shown in Exhibit XXIII, opposite. The percentage share that industry shipments represent in the domestic market has remained fairly stable over the years.

EXHIBIT XXIV

SPECIAL INDUSTRY MACHINERY

Exports to (% of Shipments)

	<u>1979</u>	<u>1976</u>
U.S.	66.7	70.1
E.E.C.	2.5	6.1
Japan	3.1	0.3
Other	27.7	23.5

Source: Statistics Canada



As Exhibit XXIV, opposite, demonstrates, some products of this category have recently penetrated the Japanese and Third World markets including South America. However, the U.S. still represents the largest market.

Domestic and export markets are generally dominated by U.S. firms. Printing machinery competition also include a number of notable European firms. Textile machinery competitors in both the domestic and foreign markets are dominated by European and Japanese companies.

Trends

Consumer demand for easier prepared foods should continue to stimulate growth in the food processing and packaging industry. As the industry tends to be small in size yet large in numbers, rationalization in food processing and packaging manufacturing will not yet occur in the 1980's. There will not be any significant new sources of supply but the markets of South America and the Middle East could represent new sales opportunities. Food processing and packaging equipment will continue to evolve but with no major technological advance.

As the printing machinery industry in Canada is relatively small and specialized, there will not be a significant amount of rationalization occurring. There will be no new sources of supply as the Japanese are not yet a threat in the world and there does not appear to be any significant new markets arising in the next ten years; however, existing markets will continue to be buoyant because of sales of the newer roll fed off-set printing equipment and related prepress equipment. The printing machinery industry has made recent technological advances in producing highly efficient and labour saving machinery and will now be moving to concentrate R & D efforts on environmental and energy problems.

The textile manufacturing industry is currently undergoing and will continue to undergo a great deal of rationalization with production moving to countries in the far East and in places such as Spain. The Japanese are becoming more competitive in this industry and there is a threat from



Czechoslovakia. The brightest prospect for new markets during the 1980's comes from South America. Electronics are now beginning to find a variety of applications in textile machinery such as the monitoring of production, the controlling of water temperatures, the dying, finishing and turning.

Outlook

As a result of the requirements for better distribution, the demand for food processing and packaging equipment will increase. In addition, new advances in the ways materials can be packaged will also stimulate demand.

Textile machinery demand is related to clothing purchases which is a function of income, demographics, fashion and many other socio-economic factors. Demand is expected to be modest.

Printing machinery demand follows the demand of its end uses and this is predicted to be moderate.

All three of these industries tend to follow the general business cycle. Firms in these industries have individual methods of sales forecasting but have in common a reliance on sales force projections.

In all three of these industries imports are likely to increase during the next decade. Exports for food processing, packaging, and printing machinery may experience some increased growth while textile machinery will most likely experience decreased exports.

Growth Forecasts

- o domestic shipments + 4.0%

MATERIALS HANDLING EQUIPMENT

Materials handling equipment relates to the handling of materials either in process or in storage. Products of this industry include travelling rails, hoists, monorails, elevators, escalators, general conveyor products and industrial trucks.

EXHIBIT XXV

MATERIALS HANDLING EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				%
1965	173.0	21.3	84.6	236.3	64.2
1970	249.3	36.3	110.0	323.0	66.0
1975	377.3	75.0	301.0	603.4	50.1
1978(e)	440.6	129.4	307.6	618.8	50.3
	% Average Annual Change				% Average Annual Change
1965-78	7.4	14.8	13.5	7.8	- 1.9
1965-70	7.6	11.1	5.4	6.5	0.5
1970-75	10.4	15.6	22.3	13.3	- 5.4
1975-78	5.3	19.9	0.7		0.1

Source: Statistics Canada



Markets Analysis

In Exhibit XXV, opposite, it can be seen that the growth of industry shipments has not kept pace with the growth of the domestic market. Canadian manufacturers have been able to export to a greater extent, however, as is the pattern with many other segments imports have been making penetration gains in the domestic market. Exhibit XXVI, following, shows that Canadian exports are shifting to the U.S.

Domestically, capital investment during the latter part of the 1970's was relatively strong and as a result orders for materials handling equipment were generally high. Almost all industries use materials handling equipment and have a desire to add or to replace existing equipment with more efficient machinery in order to increase productivity and to help offset the continuing impact of inflation. The competitors for the foreign and export markets generally tend to be the same and originate from countries such as the U.S.A., Japan and Germany.

Trends

Product mandating is in existence in some Canadian firms today and is predicted to increase in the next decade.

Although there will be no new sources of supply in the 1980's, Japan and Germany will continue to become more competitive in world markets.

There is potential for new markets as the industrialization process continues in many of the third world countries.

Materials handling equipment is becoming more sophisticated as microcomputers and microprocessors are being engineered into the various products of the industry such as in automatic retrieval systems. These more sophisticated types of equipment will be aggressively marketed by Japan and European countries while the more basic and standard models will begin to be marketed by developing countries.

EXHIBIT XXVI

MATERIALS HANDLING MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	81.0	70.5	83.8	83.2
E.E.C.	3.8	4.3	n.a.	n.a.
Japan	0.2	1.3	n.a.	n.a.
Other	15.0	23.9	n.a.	n.a.

Source: Statistics Canada



Outlook

It can be generally said that the growth of materials handling equipment relates directly to the growth of the economy and more particularly to the manufacturing sector. However, there are good prospects in the Canadian economy with respect to materials handling equipment as this machinery will be required in the energy projects which are now planned in the western provinces.

In the balance of the industrialized world, materials handling equipment also has good growth prospects as there is a move towards efficiency in industrial, commercial, and residential related product specifications.

This industry forecasts by assessing the general level of economic activity in the countries to which it sells.

As the prospects in the Canadian economy are good, and because Canadian manufacturers are becoming more specialized, the role of imports will increase in the Canadian market. As world product mandating becomes more prevalent on the Canadian scene, the level of exports will increase and the distribution of these exports will broaden in the world market.

Growth Forecast

- o Canadian shipments + 4.0%

ROLLING MILL, AND METAL WORKING EQUIPMENT

This industry includes foundry equipment, industrial furnaces, rolling mill and metal working machinery and machine tools and tooling.

EXHIBIT XXVII

ROLLING MILL, METALWORKING MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	134.0	17.6	188.3	304.7	38.2
1970	256.0	40.1	256.4	472.3	45.7
1975	392.8	95.0	427.2	735.0	40.7
1978(e)	501.4	162.9	539.8	878.3	38.5
	% Average Annual Change				% Average Annual Change
1965-78	10.7	18.7	8.8	8.5	0.1
1965-70	13.8	17.9	6.4	9.2	3.6
1970-75	8.4	18.8	11.3	9.2	- 2.4
1975-78	8.5	19.7	8.1		- 1.7

Source: Statistics Canada



Markets Analysis

Exhibit XXVII, opposite, shows a relatively predictable and stable industry during the latter part of the 1960's and the 1970's. Industry shipments experienced good annual growth rates and export performance was relatively strong with little change in the market share that the domestic manufacturers enjoyed in the Canadian market. Exhibit XXVIII, following, shows a recent shift in the distribution of Canadian exports towards the U.S. and to some extent Japan.

Major foreign competitors are the U.S., Japan and the Western European countries.

Trends

This industry is seeing intensified international competition fueled by technological advances. With plans for capital investments in developed countries, O.P.E.C. infrastructure plans and good prospects in other developing countries, foreign machine tool manufacturers will continue to intensify their marketing efforts. Non-North American manufacturers are attempting to enlarge their share of major markets such as the U.S. for standard, light and medium duty machine tools. Japan as an example is concentrating on establishing a firm foothold in numerically controlled turning machines. During the 1980's the important manufacturing sectors such as aerospace, farm machinery, construction equipment, and the automotive industries will continue to invest in new machine tools in order to improve productivity. There will be greater use of programmable controllers in the implementation of complete materials handling packages including industrial robots. There will also be a rapidly emerging market for automated batch manufacturing systems.

EXHIBIT XXVIII

ROLLING MILL, METAL WORKING MACHINERY MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	80.5	68.2	70.6	73.6
E.E.C.	6.1	6.9	n.a.	n.a.
Japan	3.3	0.6	n.a.	n.a.
Other	10.1	24.3	n.a.	n.a.

Source: Statistics Canada



A refitting of the automotive industry and development of Canada's budding aerospace industry can be good opportunities for those companies manufacturing cutting tools and accessories. Because of the spiraling raw material costs and long term uncertainties involving cobalt, cutting tool manufacturers are continuing to develop alternate cutting tool materials to eliminate or reduce cobalt content.

As the Canadian industry is relatively small and since the products offered in this industry are very diverse there will be no major structural changes during the 1980's.

Outlook

Because metal working equipment is related to the shaping of most metal parts for both consumer products and industrial machinery, metal working equipment orders are a result of capital spending by durable goods producers.

Sales forecasting in this industry is accomplished through relating to capital investment plans.

Imports into Canada will become more significant, especially in the lower and higher product ranges. Export performance is promising as Canadian manufacturers will export their expanding expertise in the middle range of products.

Growth Forecast

- o Canadian shipments + 4.0%

PUMPS AND COMPRESSORS

Manufacturers in this industry produce many kinds of pumps and compressors designed to move, control and process liquids and gases in a wide range of industrial processes.

EXHIBIT XXIX

PUMPS AND COMPRESSORS MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	148.1	16.5	127.6	259.2	50.8
1970	184.3	44.1	190.5	330.7	42.4
1975	302.2	108.9	412.5	605.8	31.9
1978(e)	504.6	191.4	531.4	844.6	37.1
	% Average Annual Change				% Average Annual Change
1965-78	9.9	20.7	12.4	9.5	- 2.4
1965-70	4.4	21.7	8.3	5.0	- 3.7
1970-75	14.7	19.8	16.7	12.9	- 5.5
1975-78	18.6	20.7	8.8		5.2

Source: Statistics Canada



Markets Analysis

Exhibit XXIX, opposite, charts a strengthening position for the pump and compressor industry. Shipments have been steadily increasing over the years resulting from strong export performance and the more recent ability of Canadian manufacturers to displace imports and gain market share in the Canadian domestic market.

Pumps are exported largely to the U.S. but with increasing success to countries such as India, Peru, Chile and the Philipines. Compressers have enjoyed good export success as a result of world product mandating and Canadian expertise especially in the mining end-use segment. Compressor sales have successfully been completed in Czechoslovakia, Poland, Hungary, Australia, Peru, and Argentina among others.

The major competitors in pumps and compressors arise from the U.S. and the U.K.

Trends

Multinational corporations will continue to rationalize production in an effort to become more competitive with the continuing industrialization taking place in many other countries.

Product development in the 1980's will be directed towards reducing energy requirements and in reducing the horsepower needed to drive the products of this industry.

Outlook

During the coming decade economic growth, increased urbanization (residential and commercial contruction) and expanded and upgraded public water and sewer facilities will provide great opportunities for pumps and compressor manufacturers. Oil and gas production, pipeline transmission and refining

EXHIBIT XXX

OTHER INDUSTRIAL MACHINERY MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				% <u> </u>
1965	84.9	2.4	53.1	135.6	60.8
1970	128.6	7.6	102.1	223.1	54.2
1975	199.5	38.6	197.8	358.7	44.8
1978(e)	364.8	43.2	386.8	708.4	45.4
	% Average Annual Change				% Average Annual Change
1965-78	11.9	24.5	14.1	13.6	- 2.2
1965-70	8.7	25.9	14.1	10.5	- 2.3
1970-75	11.3	38.4	14.1	10.0	- 3.7
1975-78	22.3	3.8	25.1		0.4

Source: Statistics Canada



are also expected to provide growing markets in the 1980's. In addition, stimulus to this industry will come from the end markets of irrigation, food processing, mining and chemical industries.

Growth Forecast

- o Canadian shipments + 5.0%

OTHER INDUSTRIAL MACHINERY

This segment of the machinery industry is very broad including valves, oil field production equipment, ventilating and dust collecting equipment, water and sewage treatment equipment, bearings and general purpose industrial machinery.

Markets Analysis

The shipment and trade statistics for this industrial category are shown in Exhibit XXX, opposite. As this industrial category contains many differing subsegments it is not meaningful to look at statistical trends. However, as an industrial category these industries in composite experienced a very high growth rate in shipments fueled by very good export performance and a buoyant domestic market.

The markets for most of the industries in this segment are the industrialized countries of the world while oil field machinery is also purchased by those countries which have petroleum resources.

Competitors tend to be firms from the U.S., Japan and Western Europe.

Trends

In order to separate the trends that are occurring in each of these subsegments, a number of the subsegments will be reviewed here.



The expected growth of demand for crude oil and natural gas should assure new and growing markets for oil and gas machinery. Enhanced or tertiary oil and gas recovery (water, chemicals and gases injected under high pressure to stimulate the flow of oil and natural gas) is also expected to provide a growing market for oil and gas field machinery. In addition to the traditional drilling and production equipment now in existence product development which incorporates electronic sensing devices to monitor and control oil drilling and pipeline operations will take place. Geophysical exploration is increasing and Canada has a noticeable expertise in this area.

The main stimulus to the valve and pipe fittings industry will result from increased sales to producers of systems and equipment for exploring, extracting, transporting and processing energy related products.

Growth in fans and blowers has resulted in the past from a surge in demand for industrial air pollution control equipment. While in the short term this growth may moderate somewhat, in the medium term prospects are very good as end-users such as power plants, chemical and fertilizer companies, iron and steel mills, pulp and paper mills, and the primary metal industries will require improved equipment.

In the bearings industry, the major product change will be the increased use of nylon as an input to production.

Whereas foreign competition used to arise chiefly from Japan, eastern European countries and Russia are now entering the market.

Outlook

Demand as it relates to the overall level of economic activity varies in the subsegments of this broad category. An industry like bearings moves with the overall business cycle while valve and pipe fittings can be inversely related as major long term projects tend to be planned during the peaks of the business cycle but implemented during the business troughs.

EXHIBIT XXXI

COMMERCIAL REFRIGERATION MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	52.4	n.a.	48.1	100.5	52.1
1970	102.7	2.5	66.6	166.8	60.1
1975	139.4	3.3	141.1	277.2	49.1
1978(e)	212.9	2.4	200.4	410.9	51.2
	% Average Annual Change				% Average Annual Change
1965-78	11.4	n.a.	11.4	11.4	- 0.1
1965-70	14.4	n.a.	6.7	10.7	2.9
1970-75	11.4	5.7	16.2	10.7	- 4.0
1975-78	15.2	-10.1	12.4		1.4

Source: Statistics Canada



The energy related industries such as valves and oil field production equipment have good growth prospects while those industries supplying ventilating and dust collecting equipment, water and sewage treatment and general purpose industrial machinery have only moderate prospects.

Growth Forecast

- o Canadian shipments + 4.0%

COMMERCIAL REFRIGERATION

Manufacturers in this industrial segment produce refrigeration and air conditioning equipment for use in the commercial and industrial market segments.

Market Analysis

Exhibit XXXI, opposite, charts an improving growth performance in industry shipments but a dropping off in exports while imports remain strong. The recent growth of Canadian shipments seems to have arisen from manufacturers satisfying domestic demands. Much of the better domestic performance registered by Canadian manufacturers has been in the industrial sector where companies have been able to capitalize on demand in industries such as petrochemicals, food processing, meat packing and recreation. Major competitors for both domestic and foreign markets are the U.S. and Japan.

Trends

Of major concern to this industry is energy conservation and the need to know and understand regulations sufficiently in advance to make production and marketing decisions.

As there are few multinational corporations producing in Canada, rationalization will not be the trend in the 1980's. The success of the manufacturers in this industry depends on their ability to produce innovative products to meet the demand of the industry in Canada and on exploring export opportunities on a more aggressive basis.

EXHIBIT XXXII

HEATING EQUIPMENT MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	78.7	3.0.	8.5	84.2	89.9
1970	88.6	2.4	11.1	97.3	88.6
1975	101.3	4.3	19.8	116.8	83.0
1978(e)	120.8	7.7	26.8	139.9	80.8
	% Average Annual Change				% Average Annual Change
1965-78	3.4	7.5	8.8	4.0	- 0.8
1965-70	2.4	- 4.4	5.5	2.9	- 0.3
1970-75	1.8	12.4	12.3	3.7	- 1.3
1975-78	6.0	21.4	10.6		0.9

Source: Statistics Canada



Increasingly, competition from countries such as England, U.S., Japan, and Denmark will pose a threat to the domestic market.

In general the demand for this industry's products moves in conjunction with the business cycle but with lesser fluctuations as it tends to be oriented to the food industry.

Over the next decade, imports are likely to maintain their market share in Canada while exports will increase.

Growth Forecast

- o Canadian shipments + 3.5%

HEATING EQUIPMENT

Manufacturers of heating equipment produce industrial furnaces, ovens and accessory equipment such as heat exchangers and waste recovery systems.

Market Analysis

Exhibit, XXXII, opposite, indicates that heating equipment manufacturers have experienced modest growth and have been able to achieve this level of growth only through aggressive exporting as domestic market growth has been somewhat depressed.

Trends

Newer heating equipment is being designed towards achieving better efficiency in the heating process.

Outlook

Increasing demand for energy saving processes will continue to boost sales of industrial heating equipment. In general, industrial heating equipment will be unaffected by recessionary factors as the shift in energy prices assures a continuing demand for this equipment.

EXHIBIT XXXIII

OTHER SERVICE INDUSTRIES MARKETS

	<u>Shipments</u>	<u>Exports</u>	<u>Imports</u>	<u>Domestic Market</u>	<u>Shipments in Domestic Market</u>
	\$ Millions				<u>%</u>
1965	314.9	43.6.	279.6	550.9	49.2
1970	493.7	115.9	423.4	801.2	47.2
1975	842.1	215.7	945.5	1,561.9	40.1
1978(e)	1,165.7	411.9	1,439.7	2,193.5	33.5
	% Average Annual Change				% Average Annual Change
1965-78	10.6	18.9	12.8	11.2	- 2.9
1965-70	9.4	21.6	8.6	7.8	- 0.8
1970-75	12.4	13.2	17.2	14.3	- 3.2
1975-78	11.5	24.1	15.0		5.8

Source: Statistics Canada



Growth Forecast

- o Canadian shipments + 4.0%

OTHER SERVICE INDUSTRIES

This is a very broad categorization including manufacturers of plumbing equipment and sanitary ware, hand tools and hand operated power tools, chainsaws, lawn mowers, snowblowers and garden tractors, hardware, instruments and related products.

Market Analysis

In Exhibit XXXVIII, opposite, it can be seen that the industries of this category have as a group grown at a high rate due in large part to their ability to sell in export markets and more recently in displacing imports in the domestic market. Exhibit XXIV, following, highlights the distribution of Canadian exports. Both the U.S. and the developing countries are important in the mix of Canadian exports.

Trends

In general it can be said that this category will grow at a high rate as the application of electronics to mechanical processes heightens. Those manufacturers producing hand-held power tools will see the conversion from mechanical to electrical. Instrumentation products touch every facet of industry from resource exploration and exploitation through to the most sophisticated manufacturing process. The Canadian industry which is composed of a few subsidiaries of large multinational companies and a large number of smaller Canadian companies which have carved out a specialization related to their technology or end markets will be provided with excellent opportunities in the next decade. As an example, high energy prices and the need to cut costs by conservation will create increased demand for more efficient and consequently more complex energy management systems for large commercial and industrial buildings. In most of the industries in this category the

EXHIBIT XXXIV

OTHER SERVICE INDUSTRIES MARKETS

	<u>Exports to (% of Shipments)</u>		<u>Imports from (% of Total)</u>	
	<u>1979</u>	<u>1976</u>	<u>1979</u>	<u>1976</u>
U.S.	61.7	60.2	73.0	73.6
E.E.C.	5.8	7.8	n.a.	n.a.
Japan	0.3	0.5	n.a.	n.a.
Other	32.2	31.5	n.a.	n.a.

Source: Statistics Canada



traditional suppliers hail from Western Europe and the U.S. but Japan has been and will continue to increase its presence in both the domestic and world markets.

The new emerging markets during the next decade will include countries located in the Pacific rim, in South America and perhaps in China.

Rationalization of Canadian production will occur as multinationals increase world charters.

Outlook

The products of this industrial sector are sold to consumers or for a commercial application. Commercial applications are strongly influenced by commercial and industrial construction and resource exploration. As the cycle for these capital investments move so moves the cycle of these industries.

Consumer purchases are influenced by the do-it-yourself trend and by the general level of economic conditions.

Over the next decade imports and exports are likely to increase as a result of specialization of the Canadian industry.

Growth Forecast

- o Canadian output + 4.0%.



IV - OVERALL GROWTH FORECAST

METHODOLOGY

In arriving at an overall forecast for real annual growth of the Canadian machinery and equipment industry we have weighted the contribution that each of the 13 sectors makes towards industry shipments and applied that percentage contribution to the the individual sector forecasts outlined in the previous section.

The individual and overall growth forecasts that we present in this report which are based on our calculations and interview program have been compared with the projections of the leading Canadian forecasters listed in Section III, U.S. forecasts to 1984, and historical Canadian shipments.

OVERALL OUTLOOK

The machinery and equipment industry consists of highly specialized manufacturers producing products which are major inputs into all phases of industrial activity. The introduction of new types and sizes of machinery and the development of improved machinery generally follows changes in the demand patterns of user industries. These changes occur as a result of trends towards increased automation of industrial processes, the discovery of new uses for various materials, the opening up of new resource areas previously uneconomical to exploit, changing patterns of demand and infrastructures and urban and transportation needs.

In its areas of strength the Canadian industry has a high level of technical competence on a par with the U.S. and other industrialized countries. Examples of machinery for which Canadian firms have developed particular competence include forest industries equipment, industrial gas turbines, nuclear valves and pumps, materials handling equipment for bulk commodities, packaging equipment and certain items of pollution control equipment.

EXHIBIT XXXV

AVERAGE ANNUAL REAL GROWTH RATE FORECASTS

<u>Sector</u>	(1) U.S. Growth 1980-1984 (%)	(2) Cdn. Growth 1980-1990 (%)	(3) Contribution to Canadian 1978 Machinery Shipments (%)	(4) (2) x (3) Contribution to Canadian Machinery Growth 1980-1990
Agricultural Equipment	3.0	3.0	12.1	0.36
Power Generation Equipment	0.0	5.0	11.0	0.55
Forestry Equipment	N/A	3.5	6.9	0.24
Construction Equipment	2.8	4.0	4.2	0.17
Mining Machinery	3.5	4.0	3.0	0.12
Special Industry Machinery	4.0	4.0	10.4	0.42
Materials Handling Equipment	2.5	4.0	7.0	0.28
Rolling Mill, Metalworking	4.5	4.0	7.9	0.32
Pumps, Compressors	3.5	5.0	8.0	0.40
Other Industrial Machinery	4.0	4.0	5.8	0.23
Commercial Refrigeration	3.5	3.5	3.4	0.12
Heating Equipment	9.5	4.0	1.9	0.08
Other Service Industries	5.0	4.0	18.4	0.74
Overall Growth Rate			100%	4.03%

Sources: (1) U.S. Department of Commerce
 (2) Peat, Marwick and Partners Interviews
 (3) I.T.C.



The relative low value of the Canadian dollar, lower energy costs than major competitors and a good reputation will enhance the outlook for Canadian manufacturers in international markets. The highly competitive nature of machinery markets and the predominance of multinational corporations in Canada will lead to further production rationalization and world product mandating.

In the domestic market demand for machinery is broad and diversified. With continuing specialization, the Canadian industry will not be able to completely fill domestic needs, but will increasingly serve narrower needs in an expanding world market.

During the 1980's the industry will look to its weaknesses and begin to work towards resolving these constraints. Labour costs, productivity, research and development, marketing and skilled labour supply are currently unfavourable issues for many manufacturers.

Growth Forecast

Performance of the machinery industry tends generally to lag economic conditions by 6-18 months; however, during the 1980's this industry will be uncharacteristically strong buoyed by capital spending, particularly in the resource sector at home and by further export success abroad.

Exhibit XXXV, opposite, compares the U.S. Department of Commerce and our derived forecast. Canadian forecast growth of power generation equipment is higher than the U.S. since Canadian expertise and world product mandates will result in domestic producers gaining export orders. Several other sectors such as construction equipment, materials handling equipment, pumps and compressors are also forecast to perform better in Canada as they are directly affected by the energy megaprojects planned for 1980's. It is felt that the heating equipment forecasts in the U.S. are high and that the Canadian market will grow more moderately as oil and gas prices will rise less quickly in Canada.

EXHIBIT XXXVI

SUMMARY OF INDUSTRY PERFORMANCE

<u>Sector</u>	<u>Forecast Real Growth 1980-1990(%)</u>	<u>Actual Real Growth 1965-78(%)</u>	<u>Actual Real Growth 1965-70(%)</u>	<u>Actual Real Growth 1970-75(%)</u>	<u>Actual Real Growth 1975-78(%)</u>	<u>Degree of Cycli- cality</u>	<u>Relation to Business Cycle</u>
Agricultural Equipment	3.0	3.4	-5.9	15.9	.5	High	N
Power Generator Equipment	5.0	3.7	1.4	8.7	1.9	Medium	N
Forestry Equipment	3.5	3.0	5.4	6.5	.8	Medium	N
Construction Equipment	4.0	3.7	-.8	12.3	3.9	High	N
Mining Machinery	4.0	2.6	3.1	2.6	-6.5	Medium	N
Special Industry Machinery	4.0	5.1	14.2	-.9	5.6	High	Y
Materials Handling Equipment	4.0	.7	3.5	1.7	-2.3	Medium	Y
Rolling Mill, Metal Working	4.0	4.0	9.7	-.3	.9	Medium	N
Pumps, Compressors	5.0	3.2	.3	6.0	11.0	Medium	N
Other Industrial Machinery	4.0	5.2	4.6	2.6	14.7	Medium	V
Commercial Refrigeration	3.5	4.7	10.3	2.7	7.6	Medium	Y
Heating Equipment	4.0	-3.3	-1.7	-6.9	-1.6	Low	N
Other Service Industries	4.0	3.9	5.4	3.7	3.9	Low	V
Total Industry	4.0	3.4	4.0	4.5	3.2		

Y= in phase with general business cycle

N = not in phase with general business cycle

V = varies by product line



The contribution that each of the 13 sectors will make towards the overall real growth rate is calculated by multiplying the percentage contribution each sector makes towards industry shipments (column 3) by the growth forecast based on our interview program (column 2).

The addition of the 13 sector contributions (column 4) then yields the overall real growth forecast for the machinery industry.

As is shown in Exhibit XXXV, the average real annual growth rate during the 1980's is forecast to be approximately 4%. The projections of the various leading forecasters who are listed in Section III place G.N.P. growth in the neighbourhood of 3.5% and the growth of the machinery industry in the range of 4 to 5%. The historic nominal growth rate for the machinery industry during the years 1975-78 was 10.8% with an average annual increase in the explicit G.N.E. price index of 7.6% yielding a real growth rate for the industry of just over 3%.

Exhibit XXXVI, opposite, summarizes real historical growth rates, our forecast for the 1980's and a comment regarding the degree of cyclicity for the segment.



V - RELATIONSHIP OF THE DEMAND FOR SKILLED LABOUR TO INCREASED OUTPUT

The preceeding sections discuss the structure and outlook for the various segments of the Canadian Machinery and Equipment Industry. In order to achieve the prime purpose of this report, however, it is necessary to link the forecasts for growth and structural change to the demand for the various categories of skilled labour used by the industry. This is a complex and difficult task; a task hindered by a major lack of appropriate data yet a task essential to a realistic forecast of the industry's demand for skilled labour. This section of our report will discuss:

- o approach to the problem;
- o definitions of "skilled" labour;
- o different relationships between output and the demand for skilled labour.

APPROACH

As noted above there are major data deficiencies which stand in the way of linking increments in output to increments in the demand for the various categories of skilled labour. In particular, no breakdown exists of the current work force by appropriately defined skill category for the various segments, and there is very little data relating to the relationship between growth in output and growth in labour demand by the different segments. In addition, productivity improvement forecasts for the different skill categories are not generally available. The best data we were able to find regarding the existing skill mix in the industry is a Machinery and Equipment Manufacturer's Association survey done in 1979. This survey does not produce results on a segmented basis and does not relate the number of skilled workers to the total work force. In addition, the survey appears to suffer from certain statistical deficiencies. In view of the radically different outlooks and skill requirements of the different segments of the Machinery and Equipment Industry a breakdown by segment is very important in deriving future demand.



Our approach to the problem has been to utilize the M.E.M.A.C. survey when we require an overview of the industry's existing skill mix, supplement it with our limited data as to the existing skill mix of the industry and, utilizing the information gained from our interviews, link our forecast increase in production to a forecast demand for skilled labour.

SKILLED LABOUR

No commonly accepted definition of what is included in each category of skilled labour appears to exist. The Canadian Employment and Immigration Commission has produced a dictionary which defines the various skill categories. These definitions are not, however, in common use throughout industry. Our interview process indicated that even within the machinery and equipment industry common definitions are not in use. For the purpose of our discussions with industry we adopted the skill titles used by M.E.M.A.C. in their survey and asked that these titles be expanded upon if this was felt necessary.

The major difference in the way the different terms are utilized appears to be in the degree of skill that is assumed in each category. This is particularly true of the terms "machinist" and "welders". Some companies when they talk of a machinist are referring to a tradesman who is skilled across many different types of operations and machines. Such a tradesman has typically undergone a three or four year training program. Other companies mean an individual who is capable of operating their particular machines and performing their required operations. Such an individual is usually referred to as "skilled enough" and his in-house training typically takes less than a year. He is not a skilled tradesman in the true sense of the word in that often if he were to leave his current employer his specific skills would be virtually useless elsewhere. He is sometimes referred to as a "skilled operator". A similar distinction appears for welders and some other categories of tradesman.

EXHIBIT XXXVII

RELATIONSHIP OF INCREASES IN PRODUCTION TO

THE DEMAND FOR SKILLED LABOUR

		Percentage Increase In All Types Of Skilled Labour Required For A 10 Per Cent Increase in Production
<u>Industry Segment</u>		
	Other Industrial Machinery	
	Firm A	3.0
	Firm B	less than 10.0
Power Generation Equipment		
	Firm A	5.0 - 10.0
	Firm B	at least 10.0
Other Service		
	Firm A	10.0 (tool and die makers)
	Firm B	2.0
	Firm C	2.7
Commercial Refrigeration		could not estimate
Agricultural Equipment		could not estimate

EXHIBIT XXXVII

RELATIONSHIP OF INCREASES IN PRODUCTION TO

THE DEMAND FOR SKILLED LABOUR

Percentage Increase In All Types Of
Skilled Labour Required For A 10 Per Cent
Increase in Production

Industry Segment

Construction Equipment

Firm A

could not estimate

Firm B

6.0 - 10.0

Special Industry

Firm A

3.7

Firm B

10.0

Firm C

6.0 - 9.0

Firm D

5.0

Rolling Mill, Metal Working

Firm A

less than 10.0

Firm B

10.0

Materials Handling Equipment

could not estimate

Mining Equipment

3.0

Forestry Equipment

Firm A

could not estimate

Firm B

5.0



In reality, the two types of worker discussed above are not separate and distinct but blend together in a continuum from the unskilled worker to the highly skilled individual. The lack of clarity in definition complicates the forecasting problem. In addition, the different segments of the machinery and equipment industry differ in the type of individual that they make use of and in the type of skilled individual they feel is most productive.

Regarding machinists and welders, for example, the machine tools industry, bearings and valves etc. appear to utilize more of the truly skilled workers while the construction equipment manufacturers appear to use almost exclusively individuals specifically trained for their machines and their operations. This difference is not clear cut, however, as one machine tool manufacturer indicated that he "did not need any more skilled tradesmen but rather needs skilled operators".

RELATIONSHIP BETWEEN INCREASES IN OUTPUT AND THE DEMAND FOR SKILLED LABOUR

Our interviews included a discussion of what relationship could be expected to hold in the future between increased production and the requirement for skilled labour. Two important variables appear to influence this relationship: the role of skilled labour in the production process (that is - does it constitute the direct or indirect labour) and expected productivity gains. The role of skilled labour in the production process varies depending upon the segment of the industry under consideration while productivity gains by skill category are generally not projected by individual companies.

Segment by segment, the estimates of the relationship between an increase in output of 10 per cent and the demand for all categories of skilled labour is shown as Exhibit XXXVII, opposite. As the exhibit shows there is a great deal of variation between the different segments labour requirements when production increases. In general, those segments which use skilled workers as the bulk of their work force come closest to having a one to one relationship between production and labour demand. For other segments 10 per cent increases in output usually require somewhat less than a 10 per cent increase in skilled labour.



These ratios for labour demand to production cannot, however, be linked directly to the growth forecasts for the various segments discussed in Section III for the following reasons:

- o basic data regarding the current skill mix of the separate segments of the industry do not exist. Hence, there is no base against which to apply the percentages;
- o the increased output forecast for the segments will take place over time (the next decade) while the estimates shown in Exhibit XXXVII are static in that they represent the relationship as it exists today;
- o the passage of time will bring many changes which could impact on the relationship. These include productivity improvements, changes in production patterns through rationalization etc., changes in the product mix and efforts by industry to wherever possible "take the skill out of the man and put it in a machine".

For all of the above reasons our forecast of the demand for skilled labour by skill category in the following section, while it incorporates the sectorially specific information is largely based on the industry overview of skilled labour contained in the M.E.M.A.C. survey.

EXHIBIT XXXVIII

Number of Interviewees Experiencing Difficulty

<u>Skill Category</u>	<u>Number</u>
Machinists	16
Fitter/Millwrights	10
Welders	11
Maintenance Mechanics	6
Tool and Die Makers	10
Welder/Fitters	9
Electricians	4
Electronic Technicians	11
Pattern Makers	5



VI - THE DEMAND FOR LABOUR

The overall future demand for the various skill categories is difficult to forecast. This section of our report deals first with those categories of skilled labour which industry perceives are or will be in short supply. It is a summary of the general impressions of our interviewees. The second part of this section is an attempt to integrate overall industry impressions, our growth forecast for the industry, other evidence regarding the relationship between output changes and labour demand in order to derive an overall forecast for skilled labour.

EXISTING AND FUTURE SHORTAGES

All interviewees were questioned regarding whether or not they were currently having difficulty, or expected, in the near future, to have difficulty in hiring certain categories of skilled labour. Exhibit XXXVIII, opposite, indicates the number of responses indicating that a skill was one which is or is expected to be in short supply. In addition to the categories shown, the following skills were also mentioned at least once: sheet metal mechanics, mold designers, senior draughtsmen, tool makers, heavy duty mechanics and non-destructive test personnel.

There are some important qualifications which must be borne in mind when viewing Exhibit XXXVIII.

1. Machinists appear to be the most widely used trade in the industry and it is to be expected, therefore, that they would be mentioned a number of times. Only one or two firms indicated that they were not having difficulty attracting machinists while the remainder did not utilize them. Not all companies, however, mean the same thing when they refer to machinist. Many companies have in mind a semi-skilled machine operator as discussed earlier in this report and while they were having problems hiring such people this was not regarded as a major problem because such individuals could be readily trained.



2. The lower numbers of people having difficulty in hiring some of the other skills does not necessarily indicate that these are in shorter supply, but simply that many companies do not utilize that type of skill. This is particularly true for tool and die makers. All companies actually using tool and die makers have difficulty in hiring them. In addition, there is very little disagreement with regard to the fact that a tool and die maker must be well trained and thus shortages of these are more critical at the present time than any other trade.
3. Welders, fitter-millwrights, pattern makers and electronic technicians are all perceived as being in short supply by most of the companies that utilize their services. In the case of welders, however, there are the same definitional problems that apply to machinists. Many companies use only semi-skilled individuals as welders and regard this as adequate for their needs.
4. The only two skill categories for which a significant number of interviewees indicated they were not experiencing difficulties were electricians and maintenance mechanics.
5. Electronic Technicians were almost universally regarded as the skill category which is most likely to be in short supply in the future. Very few companies who utilize them now are not having difficulty and all expected that as the industry experienced technological progress the demand for electronic technicians would increase dramatically.

FORECAST DEMAND FOR SKILLED LABOUR

As Section IV indicates, our overall forecast for the Machinery and Equipment industry based on the outlook for the individual sectors is 4.0 per cent per year through the 1980's. While this forecast is lower than some of the other general forecasts for the industry it represents, in our view, the most reasonable prediction for overall industry growth and is the figure on which our following demand for labour projection is based.

EXHIBIT XXXIX

JOURNEYMAN POSITIONS BY TRADE

TOTAL INDUSTRY - 1979

<u>Journeyman Trade</u>	<u>Total*</u> <u>Canada</u>	<u>Quebec</u>	<u>Ontario</u>	<u>Western</u> <u>Provinces</u>
Machinist	10,000	2,000	6,000	1,500
Fitter/Millwright	4,500	1,200	2,700	856
Welder	125	--	100	--
Maintenance Mechanic	185	30	120	30
Tool and Die Maker	900	140	600	100
Welder-Fitter	4,400	1,300	3,000	--
Electrician	725	80	400	280
Electronic Technician	280	75	125	100
Patternmaker	200	120	80	40
Other	400	150	80	120

Note: Due to Statistical Deficiencies in the M.E.M.A.C Survey the total for the regions may be greater than the Figure shown for all Canada.

* Includes the Maritime Provinces.



Current Skill Mix of the Industry

The M.E.M.A.C. survey of 137 firms in the industry was conducted in the first quarter of 1979. The introduction to the report on the survey describes the methodology as follows:

"Company size, products manufactured, and regional distribution were all taken into account in the sample selection so that extrapolation of results would reflect, as closely as possible, the actual industry. Based on Statistics Canada's employment figures, the following multipliers have been derived and when applied to the results of the survey, the scope of the skilled manpower shortage can be measured for machinery manufacturers all across Canada:

Quebec	2.4
Ontario	1.8
Western Canada	2.9
All Canada (including the Maritime Provinces)	2.0

The survey results provide data as to the number of journeymen on staff at the time of the survey plus the number of positions vacant by skill category. These two figures added together presumably represent the total number of positions existing for each skill at that time. MEMAC, however, does not represent the entire industry as defined in this study but rather its numbers cover approximately 50 per cent of industry output. Exhibit XXXIX, opposite, shows the results when the survey data is blown up to represent the entire population both for Canada as a whole as for Quebec, Ontario and the Western Provinces. As stated on the exhibit, statistical deficiencies have created some difficulties in interpreting the survey results.

Future Demand for Labour

Our overall growth forecast for the Machinery and Equipment Industry is 4 per cent per year annual growth during the 1980's. This does not translate into a demand for labour of 4 per cent per year. As discussed in Section V of this report our interviews indicated that a 10 per cent increase in

DEMAND FOR ADDITIONAL SKILLED LABOUR TO PRODUCE INCREMENTAL OUTPUT

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>
Machinists	198	202	206	210	214	218	222	226	228	232
Fitter/Millwright	92	92	94	96	96	100	102	104	106	108
Welders	2	2	2	2	2	2	2	2	2	2
Maintenance Mechanics	4	4	4	4	4	4	4	4	4	4
Tool and Die Makers	18	18	18	18	18	18	18	18	18	18
Welder Fitters	88	90	92	94	96	98	100	102	104	106
Electricians	14	14	14	14	16	16	16	16	16	16
Electronic Technicians	12	12	12	12	14	14	14	14	16	16
Patternmakers	4	4	4	4	4	4	4	4	4	4
Other	8	8	8	8	8	8	8	10	10	10



production generally requires between 5 and 10 per cent more skilled labour even in the absence of technological change. If one expects productivity improvements the figure is probably closer to 5 per cent than 10 per cent. To derive our forecast of labour demand we have therefore assumed the relationship to be for every 4 per cent growth in output 2 per cent more skilled labour will be required. The one exception is electronic technicians for which the demand is expected to increase very rapidly over the next decade. We have assumed that the demand for this type of labour will grow at the same 4 per cent per year as will total output. Exhibit XL, opposite, provides estimates of the additional skilled tradesmen that will be required by the Canadian industry to service the expected increase in production during the next decade. Because of the statistical deficiencies in the base data we have not attempted produce the forecast on a regional basis. It is to be expected that the demand would follow the existing geographical spread of the industry and be concentrated in the Quebec Ontario areas. In reading Exhibit XL it is essential that the following limitations on the information be kept in mind:

- o the statistical deficiencies in the original M.E.M.A.C. survey;
- o the fact that our forecast does not reflect the different projected growth rates and skill mixes of the different segments of the industry;
- o the results reflect trend lines only and do not attempt to forecast the business cycle as it relates to the machinery and equipment industry.

In addition to skilled labour required to produce incremental output over the next decade there are two other elements which will enter into the industry's overall demand for skilled labour:

- o existing vacancies;
- o natural attrition from the existing labour force.

EXHIBIT XLI

VACANCIES BY JOURNEYMAN TRADE

<u>Journeyman Trade</u>	<u>Vacancies</u>
Machinist	1,040
Fitter/Millwright	440
Welder	4
Maintenance Mechanic	24
Tool and Die Maker	140
Welder Fitter	348
Electricians	88
Electronic Technician	40
Patternmaker	4
Other	72



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Exhibit XLI, opposite, indicates the number of vacancies for each skill category indicated by the M.E.M.A.C. survey.

Attrition from the existing skilled labour force can result from many factors. The chief reason, however, for such attrition is retirement. The M.E.M.A.C. survey included data on that position of the labour force over fifty-five years of age as of 1979. Exhibit XLII, following, shows the demand for skilled labour created if 10 per cent of the over fifty-five segment of the work force retires in each year during the 1980's. The overall demand for skilled labour by the Machinery and Equipment Industry is, therefore, the sum of these elements:

- o existing vacancies;
- o demand to produce additional output;
- o labour force attrition.

Exhibit XLIII, following, incorporates these three aspects of demand and represents our estimate of the demand for skilled labour by the Machinery and Equipment Industry during the 1980's. This exhibit indicates that over the next decade the Canadian Machinery and Equipment Industry will require approximately 5,000 machinists, 2,200 fitter-millwrights, 40 welders, 80 maintenance mechanics, 520 tool and die makers, 1,800 welder-fitters, 320 electricians, 200 electronic technicians, 120 pattern makers and 180 others skilled people. Our general impression from our interviews is that these figures, which are based on the available statistical data are reasonable with the possible exception of the figure used for electronic technicians. Most interviewees indicated that they expected the demand for these to increase very rapidly. Our indicated overall demand for this category, may therefore, be low.

EXHIBIT XLII

NUMBER OF JOURNEYMEN REQUIRED TO
REPLACE RETIREES IN EACH YEAR OF THE 1980'S

<u>Journeyman Trade</u>	<u>Replacements Required Yearly</u>
Machinist	176
Fitter/Millwright	80
Welder	2
Maintenance Mechanic	2
Tool and Die Maker	20
Welder Fitter	48
Electricians	8
Electronic Technicians	2
Patternmaker	8
Other	1

THE CANADIAN MACHINERY AND EQUIPMENT INDUSTRY

DEMAND FOR SKILLED LABOUR

[illegible]

VII - SKILLED LABOUR SHORTAGES AS A CONSTRAINT ON FUTURE GROWTH

THE IMPORTANCE OF SKILLED LABOUR

All interviews were questioned as to the importance placed upon the availability of skilled labour in making a plant location decision and whether they preferred a "thick" labour market such as Toronto or Montreal where there is a large pool of skilled labour of all types, or a "thin" labour market such as the Maritimes or rural Ontario.

Most interviewees expressed a strong preference for the "thick" labour markets of Southern Ontario or Montreal. This feeling was generally based upon the view that in a thick labour market your chances of finding the skilled labour you require was much greater than in a thin market even though the competition for the labour is greater. In addition, a thick market allows for more flexibility in adjusting your labour force to current demand conditions. It is possible to reduce your labour force during an economic downturn and still have the necessary skills available when you require them again. This is particularly true for industries that do not run in phase with the general business cycle.

While the supply of skilled labour, was almost inevitably mentioned as a crucial variable with regard to plant location decisions three qualifications with regard to the preference for a thick labour market must be kept in mind:

- o all interviewees were located in the relatively thick labour markets of Southern Ontario and Quebec and our sample is therefore, biased. The industry itself, however, has shown its preference in this regard by locating the majority of its production in thick labour markets;
- o the question of a thick versus a thin labour market is impossible to separate from the other advantages that arise in the geographic areas having a thick labour market: proximity to other inputs, transportation, markets, etc. Most interviewees did not differentiate these clearly and regarded them all as important considerations:



- o very few of the companies interviewed had actually made a location decision in recent years and had not, therefore, given careful consideration to the factors that would enter into such a decision. Many indicated that their present location was more of a historical accident than the result of careful analysis.

SKILLED LABOUR AS A CONSTRAINT ON GROWTH

Shortages of skilled labour are perceived as a problem by the entire industry; such shortages are not, however, universally regarded as a particularly serious problem. It should be kept in mind that industry would probably like to have a supply of all types of skills readily available during all phases of the business cycle at a constant price. Shortages of skilled labour or any other factors are to be expected during peak periods of the business cycle. These shortages are the market's way of indicating that capacity has been reached. Only if skilled labour shortages are the sole constraint limiting output can a case be made for increasing the supply. In addition, if enough skilled labour existed to meet industry's demand for skilled labour at the peak of the cycle this would necessarily imply unemployment of some of that labour during periods of lesser demand.

Some companies do, however, regard the skilled labour supply as the major constraint on industry growth both now and in the future. They regard it as the chief impediment to further growth. Other companies do not share this attitude and regard it as a problem that one way or another will be dealt with either through training or productivity improvements. In general, there are no major characteristics which define the viewpoint an individual company will take. To a certain extent those companies that view the problem as critical tend to be in the industries which make the greatest use of the truly skilled labour. This is not completely true, however, as one machine tool manufacturer indicated he felt the shortage of skilled labour was a "solvable constraint". There appeared to be no geographic basis for different opinions expressed.



VIII - THE SUPPLY OF SKILLED LABOUR

Our interviews with corporate executives included a series of questions designed to elicit their viewpoint with regard to the causes of the current difficulties and suggestions as to appropriate courses of action to solve the problem. No consensus of opinion could be derived and what follows is a summary of the different viewpoints.

REASONS FOR CURRENT DIFFICULTIES

Several possible reasons were advanced as to why Canadian industry suffers from a shortage of skilled labour. The first of these is the traditional attitudinal problem toward blue collar work. Most executives feel that too much emphasis has been placed on university training with a consequent downgrading of the status of blue collar work. This has inhibited the flow of young people into the trades.

Another major reason cited for our current shortage of skilled labour is the shrinking of our traditional supply of skilled labour from Europe. Almost all companies interviewed previously relied, to a considerable extent on European immigrants to supply their needs. Some companies went so far as to indicate that for the "truly skilled" portion of their labour force they had relied almost entirely on immigrants. Skilled immigrants are no longer available in large numbers. Most companies indicated that it was not possible to attract Europeans, except possibly the British, in any significant quantity. Those that have recruited overseas themselves find that they have achieved poor results in relation to the costs expended. Very few had experienced any difficulty with Canadian immigration policy but felt the problem was basically one of European living standards having reached or surpassed those of Canada thus reducing the incentive for skilled tradesmen to emigrate.



The above two reasons have, to some extent, contributed to a third reason mentioned as a cause of Canada's difficulties - a lack of proper training and apprenticeship facilities. Because Canadian industry has previously relied on immigrants they have not created training programs and because of the lack of status of blue collar occupations there has not been a large demand for such programs.

A fourth contributor to Canada's difficulties mentioned is the problem of "wage rate compression" the lack of sufficient spread between the wages paid to skilled workers and those paid to unskilled workers. Many interviewees felt that the gap was no longer sufficiently large to justify the additional time and effort required to become a skilled worker. Many attributed this fact to the bargaining approach of trade unions which represent primarily the unskilled and semi-skilled workers and consequently strive to narrow the gap between the wages paid to skilled and those received by the unskilled. It was not generally felt that anything much could be done about this.

Suggestions For Solutions

Almost all executives interviewed felt that attitudes toward blue collar work etc. should be changed. When it comes to specifics, however, there is little or no consensus.

There are two general schools of thought. The first, usually supported by executives of companies who use more of the semi-skilled machinists or welders and less of the highly skilled journeyman feel that the educational institutions do a good job of training workers and that more "community college" type training was the appropriate solution. These companies are generally looking for a "technically literate" individual who can then be rapidly trained to meet their needs. They stress that the training institutions must provide more of the basic technical skills such as blueprint reading and should approximate an industrial atmosphere but do not generally believe more technically specific programs are required.



The second school of thought, generally held by executives of companies which use more of the highly skilled types of workers, stresses more on the job training and apprenticeship programs. They also favour more direct industry control (although not necessarily financial support) of the training process. Their views are summed up in the following excerpts from a brief submitted by the Canadian Tooling Manufacturers' Association to the Parliamentary Task Force on Employment Opportunities For the 1980's:

"We believe that the basis for industrial training is on-the-job training through regulated apprenticeship program guidelines. Related, or theoretical training, is best done through existing educational institutions. Industrial training can be short or long-term training (short-term is one year or less). Both are required to meet specific job oriented skill requirements. Both are required for retraining as well as base technical knowledge. On-the-job training is the best place for the transfer of skills ... stating that crash programs, shifting on-the-job training to institutions is not the answer for the development of on-the-job skills ... we support industry-controlled industrial training centres... So that there is no misunderstanding of this support, we do not support sub-contracting of on-the-job training to Community Colleges. We do support sub-contracting of on-the-job training to industry-controlled training centres. We recommend financial support by the federal government to these industrial training centres located where there is adequate industry support, as a supplement, to the fundamental financial support of industry of on-the-job training (short or long-term). We believe that on-the-job training is a continuation of the educational process and as such, should receive the financial support accorded to education. The extent of this support should provide the employer a subsidy equal to his costs of on-the-job training, thus, eliminating the non-competitiveness of companies who train versus those who do not. We are not prepared to recommend the source of these funds (levy, taxation, etc.). This is a political decision."



IX - SUMMARY AND CONCLUSIONS

The preceeding sections of this report have dealt with the specifics of forecasting the demand for skilled labour for the Canadian Machinery and Equipment Industry and with various issues impacting on the supply of skilled labour to the industry. As noted in the introduction our efforts in this area have been hindered by definition and data problems. As a result our report is very much an overview of the issues involved. In this section we will summarize the major methodological and technical issues which arose during the course of our work.

SCOPE OF STUDY

Our study covered the Machinery and Equipment Industry as defined by DITC. This is an extremely large and diversified industry. Each of the thirteen segments could be thought of and examined as an individual industry. If it is desired to have sound industry data in which to base a forecast demand for labour this, in fact, is what would be necessary. Certain segments are, however, more complicated than others and consequently are undergoing more changes that will impact on labour demand than some of the other segments.

In addition to overall industry growth rates such factors as changes in technology, product mandating and production method changes will also have a major impact on the industry's demand for skilled labour. These factors vary considerably between the segments considered to be part of the Canadian Machinery and Equipment Industry. Some segments are experiencing great changes while others are not. Any future work should keep these facts in mind when determining the scope of work to be undertaken.

DATA DEFICIENCIES

In order to derive a credible forecast of the future demand for skilled labour it is necessary to have certain data regarding the industry. In particular, the following data for each separate segment of the industry is required and does not currently exist:



- o accepted definitions of the various skill categories;
- o for each segment a description of the existing skill mix of the industry; and
- o the general relationship between volume of output and the demand for skilled labour.

If skilled labour forecasts for individual industries are to be developed in the future then the gathering of the appropriate statistical data will be a necessary precondition for such studies.

IS SKILLED LABOUR A PROBLEM?

As noted above shortages of skilled labour are widely perceived in the industry to be a problem. It is not clear, however, how serious the problem is. Many firms interviewed do not regard it as critical. To them it is simply one of the ongoing problems of doing business similar to high interest rates or a shortage of good executives. They do not regard it as sufficiently critical to constrain output in the current decade.

In addition the problem is perceived to be different for different trades. Many regard the shortage of machinists as of considerably less importance than tool and die makers. The former can be trained in a relatively short time while the latter require several years.

Many companies do not differentiate between a cyclical shortage of skilled workers at the peak of the business cycle and an on-going structural problem. Clearly if industry were able to hire all the skilled workers they required at the peak of the cycle there would be considerable unemployment during the remainder of the cycle.



In summary the following may be said:

- o shortages of skilled labour are widely perceived to be a problem in the machinery and equipment industry; and
- o the degree to which it is considered to be a critical problem varies from segment to segment and even between firms in the same segment.



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APPENDIX I

Interview Guideline

CANADIAN EMPLOYMENT AND IMMIGRATION COMMISSION

Interview Guideline

THE GLOBAL OUTLOOK

1. What do you see as the major trends in the global industry over the next decade?
 - o rationalization of production via multinationals?
 - o growth of new sources of supply such as Taiwan, Rumania, etc.
 - o growth of new markets.
2. What are the major international markets for your industry's products?
Do they move freely in international trade?
3. What barriers, if any, are there to the free movement of your industry's products in international trade? Have these barriers changed recently or are they forecast to change and if yes, what are the implications for the future of your industry (re: production patterns, markets competition, etc.).
4. Are there likely to be any major changes in the products of your industry over the next decade? If so what type? Will they result in or from any major changes in production methods? Any other major technological changes and their impact?
5. What at a global level, are the major determinants of the level of demand in your industry?
6. How does demand for your industry's products move with regard to the business cycle? Pro, contra or in some other fashion?
7. Do you see your industry growing faster, slower, or at about the same level as overall economic activity? At what rate?



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8. How does your firm go about forecasting its own future sales and production levels?
9. In the international market how are prices for your industry's products established? Over the next decade do you see prices rising faster, slower, or at about the same rate as the general price level? If different than general prices how much different and why?

THE CANADIAN INDUSTRY IN A GLOBAL CONTEXT

1. What are the major markets for the output of your industry (by country/ and user)? Now? Future changes? Does your own company's sales mix re: markets match that of the industry?
2. What are the major competitive strengths and weaknesses of the Canadian industry?
3. Who are the major foreign competitors for:
 - o the domestic market?
 - o export markets?
4. Over the next decade are imports likely to:
 - o increase their market share in Canada?
 - o increase in absolute amount?
 - o If yes, where will the increased competition come from?
5. Over the next decade are exports likely to expand, shrink, stay the same? Is the product and/or country mix for Canada's exports likely to change? If so why?



6. Could you speculate on the rate of growth over the next decade for:
- o the domestic market
 - o imports
 - o exports
 - o the overall level of Canadian output
7. Do you foresee any major structural changes in the Canadian industry over the next decade resulting from:
- o the role of actions of multinational companies?
 - o technological change?
 - o geographical distribution of production?
 - o others?

If yes, details.

8. What are the factors which determine plant location decisions in your industry? How do you view the advantages and disadvantages of locating in a "thick" labour market such as Southwestern Ontario or Montreal versus locating in thin labour market areas such as the Maritimes, Saskatchewan, Manitoba or Eastern Ontario?

THE DEMAND FOR CANADIAN LABOUR

1. Is the availability of skilled labour likely to be a constraint on the rate of growth of Canadian output over the next decade? If yes, to what extent? General across all trades and regions or specific to certain trades and regions?
2. Are Canada's difficulties in this area likely to be more severe than those of our major competitors - particularly the United States?



3. What particular types of skilled labour are most likely to be in short supply? Please indicate which of the following trades:
- o Machinists
 - o Fitter/Millwrights
 - o Welders
 - o Maintenance mechanics
 - o Tool-Die Makers
 - o Welder Fitters
 - o Electricians
 - o Electronic Technicians
 - o Pattern makers
 - o Other
4. In general terms what is the relationship between real increases in output and your requirements for skilled labour? If output increases by 10% will the demand for skilled labour increase by more or less than this amount? What is the relationship for each of the following skill categories?
- o Machinist
 - o Fitter/Millwright
 - o Welder
 - o Maintenance Mechanic
 - o Tool-Die Maker
 - o Welder Fitter
 - o Electrician
 - o Electric Technician
 - o Pattern Maker
 - o Other
5. Over the next decade what do you foresee in productivity improvements which will reduce the demand for skilled labour which would otherwise occur? What will be the impact on each of the skill categories listed above and when will the impact likely occur?



6. U.S. Government forecasts predict substantial productivity improvements in most sectors of the Machinery and Equipment Industry over the next decade. For most segments of the industry the forecast increase in employment is much less than the forecast increase in output. Do you think the outlook for Canadian industry is similar? If similar gains in productivity are expected will they effect all categories of labour equally or will they have a greater or lesser impact on the various categories of skilled labour? Details.
7. For your own Company what is your forecast of:
 - o the real growth in output per year over the next decade
 - o the growth in demand for labour of all categories
 - o the growth in demand for skilled labour (by skill category if possible).
8. Do you believe your expectations in this regard are representative of the industry as a whole? If not why not? Specify.
9. Do you anticipate that you will be faced by shortages of skilled labour over the next decade? If yes which particular skill and when?

LABOUR SUPPLY

1. What in your view are the prime causes of the current and forecast imbalances in the supply and demand for skilled labour?
2. What actions to alleviate the problem would you suggest be undertaken by:
 - o industry
 - o the government



3. Has your company, in the past, relied on immigrants to satisfy your requirements for skilled labour? What role do you think immigrants will play in the future? Do you have any suggestions regarding federal immigration policy?
4. What are your views regarding the provision of training programs to develop the supply of skilled labour? In particular what are your views regarding:
 - o industry run and funded programs
 - o government run and funded programs
 - o appropriate combinations.
5. What role in your view can wage differentials play in alleviating skill shortages? Are wage differentials between skilled and unskilled workers currently too low? What problems are there in trying to widen this gap?
6. How does your company attempt to cope with skill shortages? Do you have any plans to cope differently in the future?

